# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CXII. No. 2483.] LONDON, DECEMBER 13, 1910. [62ND YEAR. PRICE 6d.



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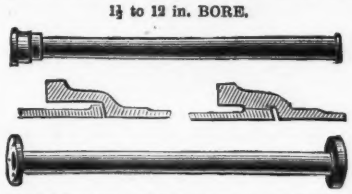

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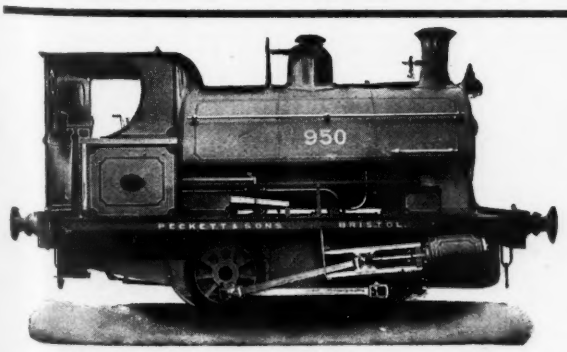


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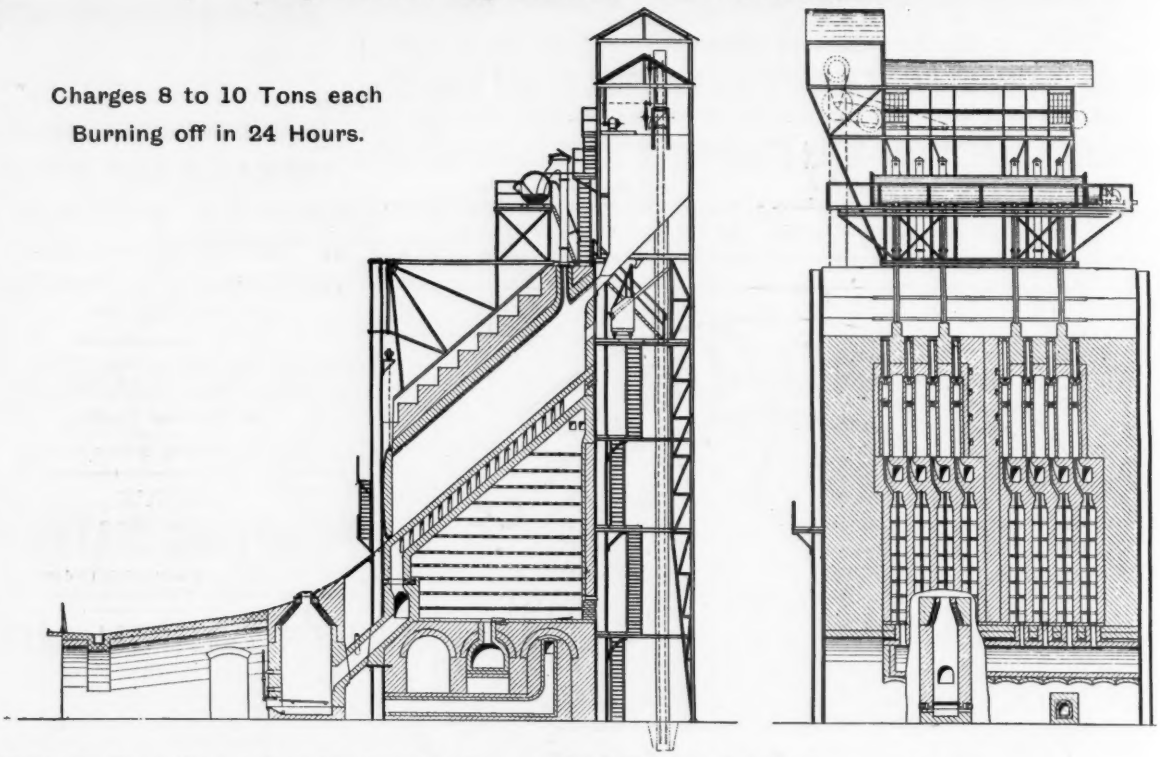

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## ADVANTAGES:

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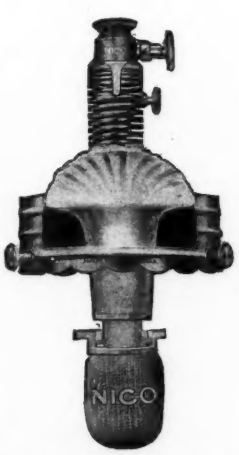


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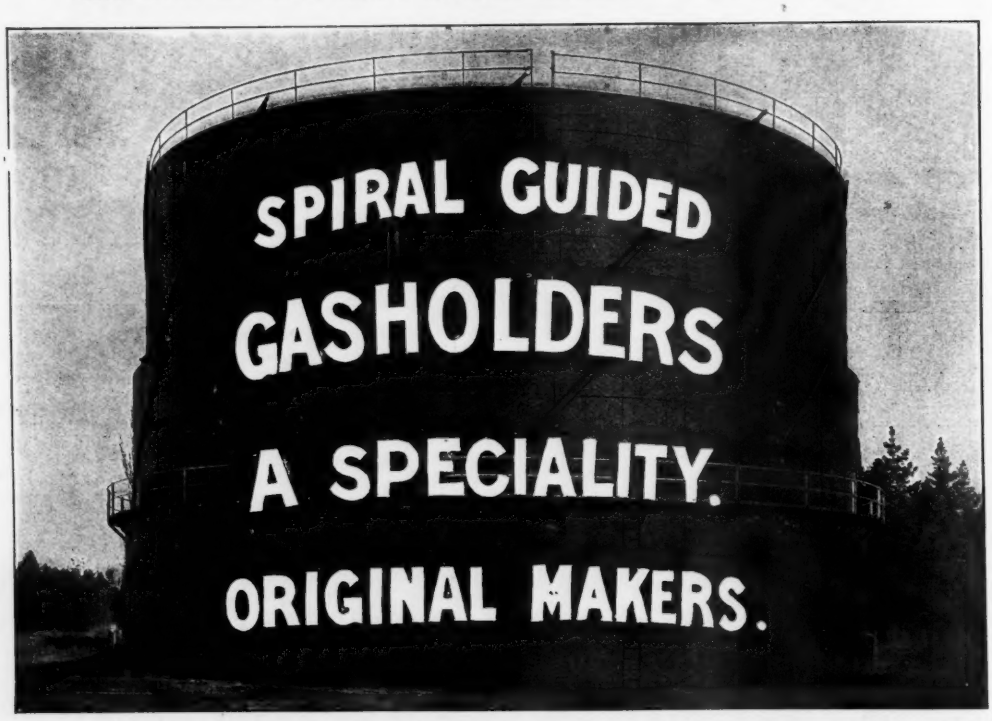


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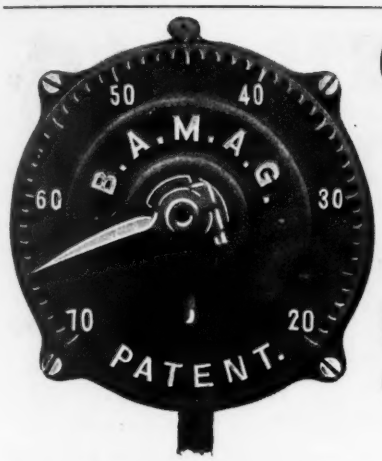


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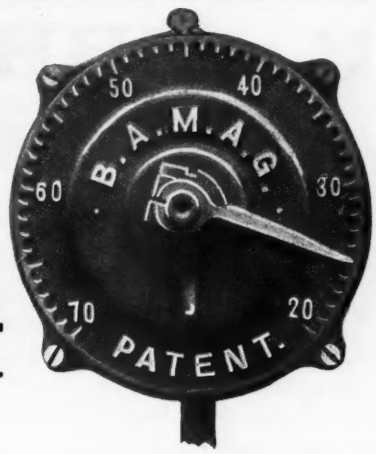


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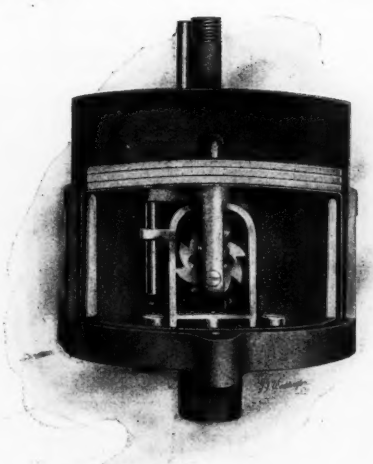

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Requires no Winding.

Can Extinguish Different Lights at Different Times as required.

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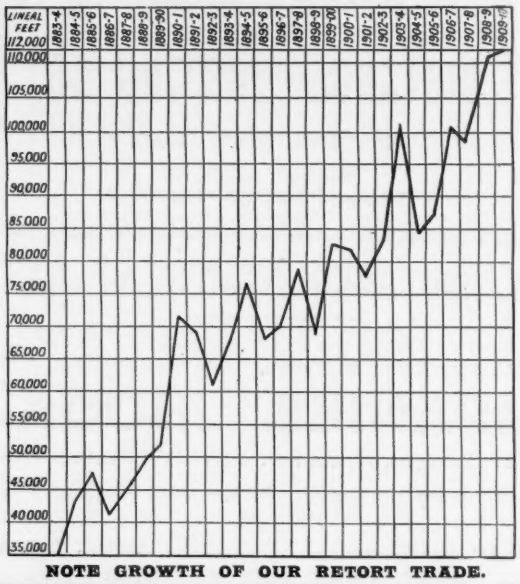

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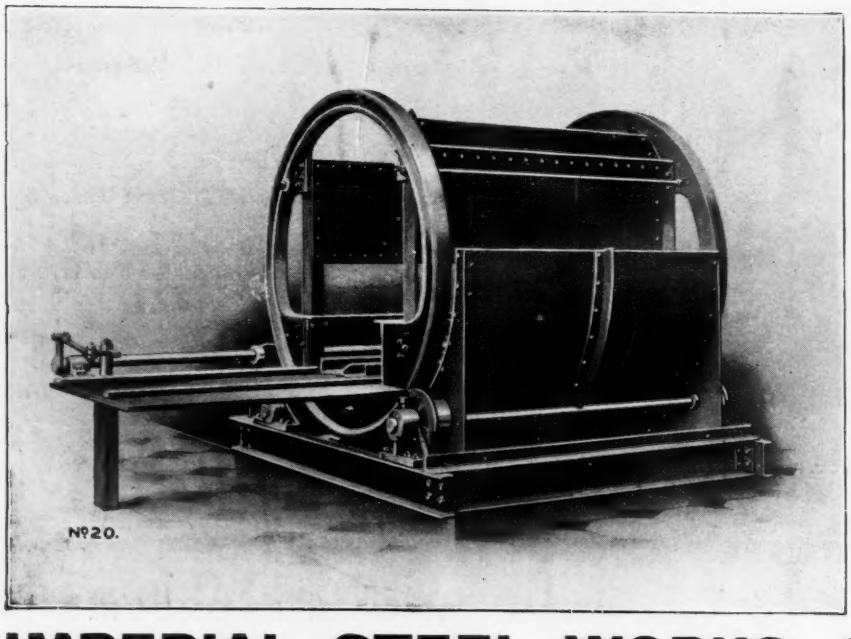


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AUTOMATIC TIPPLER,
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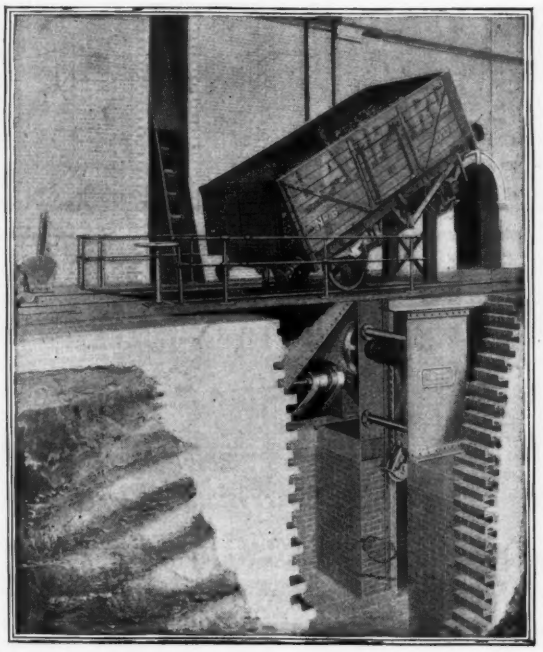
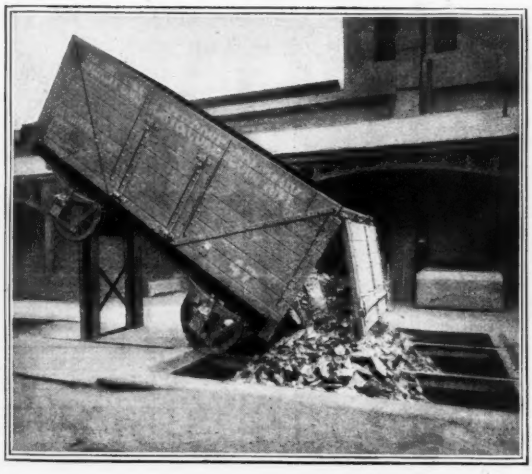


Many installed in conjunction with Coal Handling Plants, giving in every case entire satisfaction



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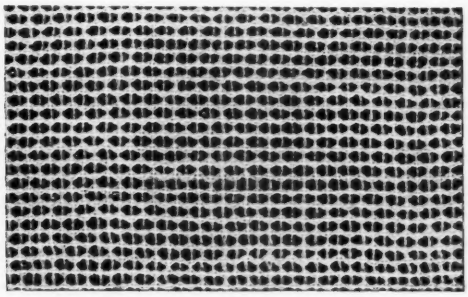
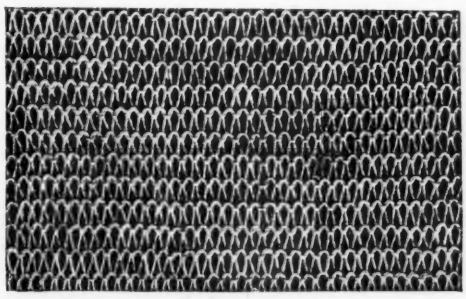
The following illustration shows clearly that the threads run in straight lines, and that no part displays an angular structure.



**Loom-Woven Mantle.**

In order to emphasize the increased strength of a loom-woven mantle over a knitted mantle, the following illustration gives a representation of the mesh of an ordinary knitted mantle, as usually supplied to the trade. The marked difference in the increased strength of the mesh of the loom-woven mantle must be apparent to the most casual observer.



**Knitted Mantle.**

We understand that a number of engineers connected with leading gas companies, after giving these mantles a prolonged test, have pronounced emphatically in their favour; and the mantles should certainly prove of great interest to all engaged in street lighting and maintenance work—*Journal of Gas Lighting, Nov. 29, 1910, p. 632.*

---

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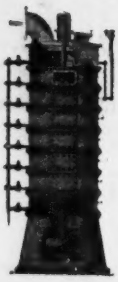
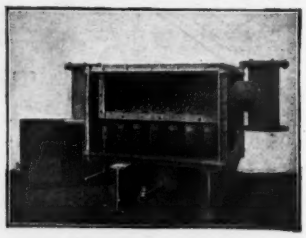


CENTRIFUGAL WASHER.



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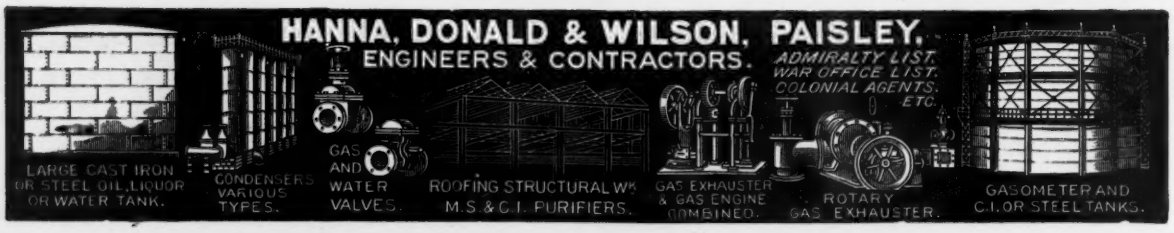
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**30-C. P.**
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**At 20-10ths Pressure.**

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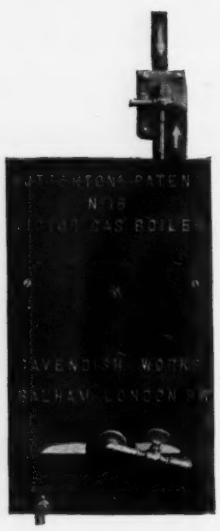

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Our installations embody the best practices in hot water engineering to effect the desired results with certainty of action, combined with high efficiency, and we are always willing to afford advice to users of our appliances in matters appertaining to the work.

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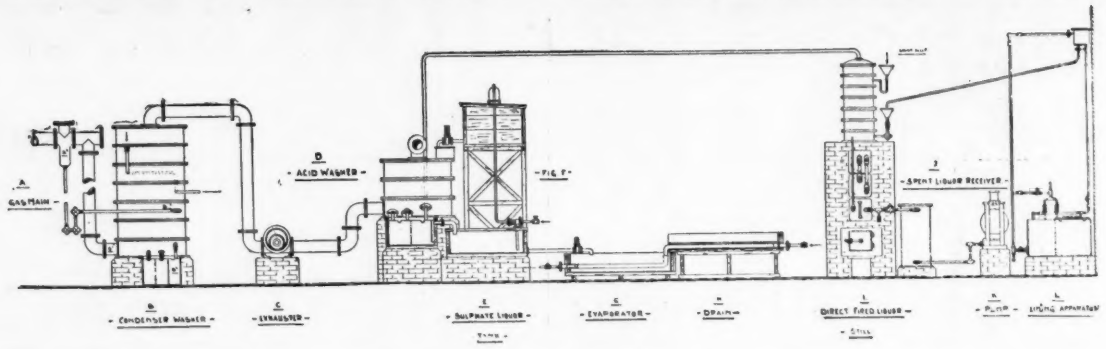


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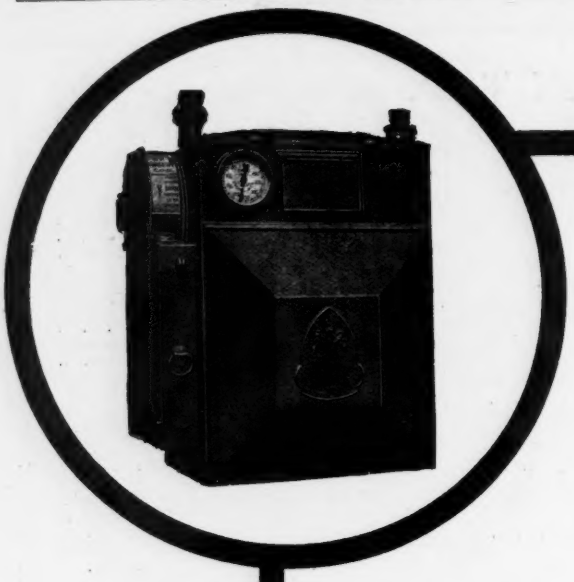

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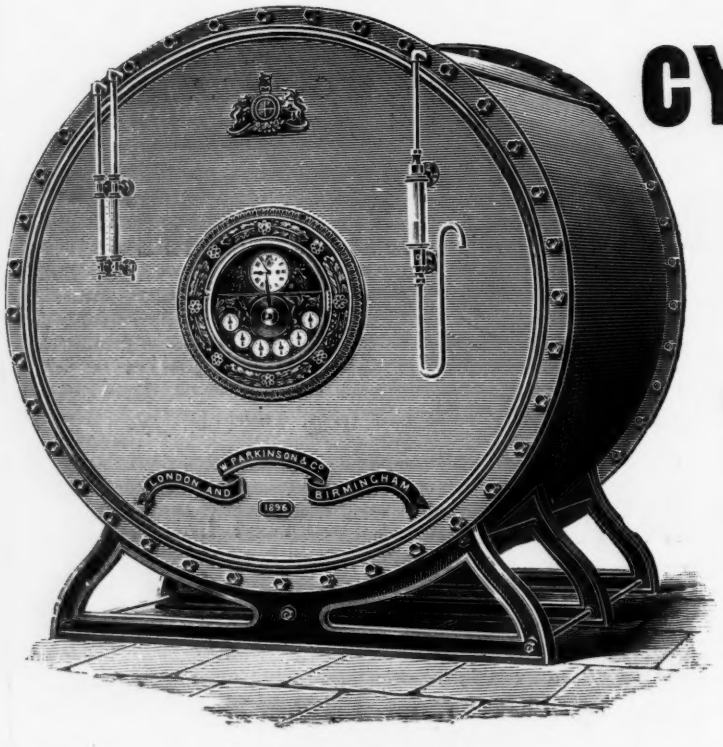


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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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## EDITORIAL NOTES—GAS, &c.

### The Undegenerate Gas Industry.

**The Effects of Increased Make of Gas per Ton.**

THE commercial rivals of the gas industry are prone at times to a little mental aberration anent the wasting away of the gas industry through their competitive exertions; and the terrible state to which (in imagination) the industry is being reduced is occasionally set forth with undisguised pleasure in the electrical press, to the amusement of those of the gas industry who see these fantastical performances. It entirely passes our understanding why concrete facts so easily procurable in this instance should be set on one side in favour of unrealities. The Board of Trade returns relating to statutory gas undertakings are as available year by year to our electrical contemporaries as to anyone else; and they can learn from them, if they so desire, the history of a progressive development. The newly issued ones (from which some figures were reproduced in our columns last week) bring the information in the case of statutory gas companies up to December last year, and in the case of municipally owned gas concerns to the end of March last; and, as we expected they would be, the figures are of greater importance than ever in their disclosure of a conspicuous enhancing of the stability of the industry through working economy development and business expansion. It is altogether a good tale the statistics have to tell, in both their technical and commercial sense.

There are only this year four additional undertakings included in the returns (taking company and local authority ones together); these making the total 794. The capital employed by them amounts to £132,123,284, which is an increase, in comparison with the previous year, of £1,414,591. The total capital employed (including the amounts added by conversion and premiums) represents a few shillings under £744 per million cubic feet of gas sold, which is less by about £8 per million than in the preceding year; while the added capital introduced is the equivalent of £379 per million on the year's gas-sale increment. There is not much value attaching to the latter figure, excepting that it assists in pointing to capital economy, notwithstanding the huge demands of the distribution departments of gas undertakings in these times. Passing onward, the total receipts for the year amounted to £30,350,042, which was a reduction of £169,597. The year covered was one in which there were many reductions in the price of gas; and it was one, too, in which the market values of residual products were not on the best levels of their recent records—coke and tar being particularly disappointing features. When it is brought to notice that 1d. reduction per 1000 cubic feet on the total sale of gas of the country last year would represent more than three-quarters of a million of money—actually £740,362—and considering the causes already referred to affecting revenue in the year, a diminution of only £169,597 on an aggregate revenue of £30,350,042 is not a matter claiming much consideration. But to set against this reduction of revenue, we have a saving in expenditure amounting to £666,066; the total outlay of the twelvemonth having been £22,808,643. Taking the reduction of revenue from the reduction of expenditure, we have to the good a sum of £496,469; and this is the amount by which the revenue balance of the statutory gas industry—£7,541,399—is better than in the preceding year.

It is not difficult, surveying the conditions of 1909-10, to place the finger on the causes for the remarkable financial improvement. Against the indifferent markets for coke and tar, there has to be set an increase in the amount of gas sold of 3,729,548,000 cubic feet—the total sale having been 177,686,943,000 cubic feet, from a total production of coal and water gas of 193,547,394,000 cubic feet, which was an increase of 3,628,657,000 cubic feet. This is the point at which we arrive at what must, technically and financially, be regarded as the most significant feature of the whole of the returns, and that is the economy that has been effected internally, and which has left a marked and gratifying impression on the finances of the industry. We were showing not long since that in the year 1908-9, deducting the water gas produced, an extra 63,066,000 cubic feet of coal gas was made, though the aggregate consumption of coal was 12,446 tons less. But these figures are wholly dwarfed by the revelations of the returns before us; for last year the consumption of coal by the statutorily controlled gas industry (15,225,320 tons) was no less than 168,987 tons below the figure for the previous year, while the coal gas made (again omitting all water-gas production) was 1,632,331,000 cubic feet more—the total make of coal gas having been 169,922,207,000 cubic feet, compared with 168,289,876,000 cubic feet. Let us emphasize the figures by repetition: Less coal used, 168,987 tons; more coal gas made, 1,632,331,000 cubic feet. This is the most remarkable disclosure of the present returns; and needless to say it is the most gratifying. That the industry has, with common consent, set its face steadfastly towards the realization of the fullest economy in working through the modern carbonization practices, is seen by the fact that (taking the aggregate figures) the make of coal gas divided by tons of coal indicates an average production of no less than 11,160 cubic feet of gas per ton. This is good, taking works from large to small included in the returns, and considering the variety of coal from good to comparatively poor in gas-yielding quality that is consumed according to geographical position in the industry. Still, considering all things, we shall look for the average being still further heightened, for from some of the coals that were formerly accounted as being comparatively poor in their gas-yielding property, we have seen figures, working under modern conditions, better than the average one quoted above.

Among the miscellaneous items of interest representing progress and expansion are these: The mileage of distribution mains of 35,230 is an increase of 740; the number of consumers (6,164,066) represents an augmentation of no less than 247,946; and the number of public lamps lighted (712,903) is an enlargement by 12,207.

Statistical reflections on the returns are highly satisfactory and encouraging; and, on this occasion, the satisfaction is intensified by the notable economies that have been achieved in the manufacturing department. An industry that is developing economy in its working results, expanding its connections, and pushing out its distribution system into new fields, and whose business during the daylight hours is growing so rapidly, as is the case with the gas industry, exhibits no trace of that degeneracy of which rivals occasionally talk and write with tongues and pens more ready than wisely directed and controlled.

### Low-Temperature Carbonization Again.

SINCE the early part of 1908, many things have happened in connection with the production of more profitable results in the carbonizing operations of gas undertakings; and having all that has transpired in view, we should now like to ask our friend Professor Vivian B. Lewes whether he still adheres to the advice he gave gas engineers, at the Society of Arts, in the spring of the year named, to transfer their affections from high temperature to low temperature carbonization, and also whether at Hythe and Plymouth the financial predictions he then made, on a suppositious basis, have worked out in practice? The reason we now ask if latter-day experiences in the new gas-works practices have altered Professor Lewes's view, is because the lecture relating to smoke abatement that he delivered at the London Institution the other evening leaves us uncertain as to whether or not he considers the aerial flights he allowed his imagination to make in 1908 in his recommendations to gas engineers have been at all curtailed. If he does not reply, we must take it that there has been a modification of view; for the London Institution lecture is entirely silent

regarding the abandonment of high-temperature carbonization and the adoption of low-temperature carbonization by gas undertakings.

But Professor Lewes does not completely abandon his position, because he says that—while admitting that the Coalite Company are at present labouring under difficulties—he is as convinced now as he was when he first examined the process (remember the metamorphosis it has undergone!) that, when its manufacture is properly handled, coalite will be the "ideal fuel," and will not only solve the smoke problem in the easiest possible way, but will also be an economical advance in the treatment of coal. But what have the British Coalite Company and their technical advisers been doing if, after three years' experimenting—for different periods at Wednesfield, Barking, Plymouth, and Hythe—they are not even yet properly handling the manufacture of coalite? We have grounds for fearing that the Company are still floundering about in an attempt to learn how to properly "handle" the manufacture. A letter to-day in our "Correspondence" columns supplies some curious information concerning the plant at the Plymouth Gas-Works, about which there has been a fair amount of secrecy as to how it has been behaving, or (shall we say?) misbehaving, itself. We know, too, of the eviction of the plant from the Hythe Gas-Works, and a certain old-iron transaction. In no one instance has there been, after all that has been done, any of the promised proof (it would have been a miraculous thing if there had been) that low-temperature carbonization is technically and commercially superior to high-temperature carbonization to the gas maker—more so high-temperature carbonization as now practised. Professor Lewes is as well aware as we are that the newer carbonizing practices of the gas maker have distinctly further widened the gulf between low-temperature and high-temperature carbonization from the point of view of economical and of commercial gas production. He partially confesses it in admitting that economies have been found in gas making in larger charges than ever before attempted, and that the introduction of the vertical and oven retorts is a step in the direction of making coke which is more fitted for domestic fuel than "the over-heated "product made in horizontal retorts of late years."

This is a point upon which we should also like to learn something more of the views of our friend—as to whether or not he considers the heavier charges in horizontal retorts have not done something "of late years" to remove the degradation with which he covers the coke produced in them. At the present time, whatever the character of the coke (and we know it to have been improved), reports from gas-works assure us that the coke market is in a highly flourishing condition. Prices are good; and there are several cases within our knowledge where stocks have been cleared out, and contracts can only be executed as the retorts yield their spent material. There is acquaintance with at least one instance in which a gas-works has had to refrain from booking further coke orders; and another case in which there has had to be purchase of coke by one gas-works from another in order to meet pressing needs. Such experiences are not isolated. But is this the coke of which Professor Lewes speaks in his lecture? There is a further charge levelled in the lecture against high-temperature carbonization. It is asserted that the gas manager has ruined the tar market by overheating his retorts, and "so loading his tar with free carbon and naph-"thalene as to make it nearly worthless." The tar produced under the current practice of heavy charges contains less free carbon and naphthalene than in the days of high temperatures and lighter charges; so that Professor Lewes, if he made the attempt, would have some difficulty in substantiating his charge. The fact is that his indictment of high temperatures has lost the little supporting substance it had. It would, therefore, be a considerable satisfaction to the gas industry if he would take the changed circumstances of operation in gas-works as stepping-stones over which to cross from his advocacy of low-temperature carbonization for the purposes of gas manufacture to the high-temperature process, and rank himself with those who have, in the selection of their methods, to give due weight to commercial interests and current requirements, as well as to chemical considerations.

There is the point, too, as to coalite being the "ideal" fuel. There again the gas industry crosses swords with the lecturer. The ideal fuel is the one that, in addition to being smokeless, goes the farthest in removing labour from the household; and that fuel is gas of reasonable calorific value. It does all that coalite can do, except that it is not "poker-"able," and the structure in which it is used for producing heat has a strong objection to being made the final receptacle for cigar stumps—one of the advantages that Professor Lewes sees (we recognize here the lecturer's jocular habit) in maintaining the solid-fuel stove. Pleased enough as we should be—inasmuch as it would afford a market for two gas-works products—to see Siemens's idea of thirty years ago adopted, of using swing atmospheric gas-burners for lighting up coke fires, and occasionally using the burners for re-animating the coke, this can only be looked upon as a cumbrous expedient in comparison with the gas-fire, as it still involves labour, and would not look particularly æsthetic in any room. The only place, perhaps, in which it might be suitable would be the kitchen range; and there householders are finding out that the excellent local heat supplied by a good coke fire is extremely serviceable for heating in connection with hot-water circulating systems, for clothes airing, and so forth. However, though in low-temperature carbonization, and the production of a semi-carbonized material in which some of the volatile constituents of the coal are allowed to remain, Professor Lewes holds that there is the most economical method of using coal, the fact remains that the manner of the use has to comply with the best means of serving certain definite ends; and, realizing this, the gas-supply industry conducts its technical operations accordingly.

## Singular Case of the Continental Union.

Flooded gas-works, a huge and expensive strike, and an earthquake make a combination of evil circumstances that must be without parallel as forming the subject-matter of any single speech from the Chairman of a Gas Company to the proprietors. But it is a fact that these (in the order mentioned) composed the main themes—not so much the actual occurrences, as the effects financial and otherwise—of the address of the Chairman of the Continental Union Gas Company (Mr. J. H. Birchenough, C.M.G.), at their meeting last Tuesday. Four-fifths, in round figures, of the capital of the Company represents their investment in the Union des Gaz; so that, when speaking of the affairs of the one Company, to all intents and purposes the affairs of the other are also involved. The floods near Paris, by which the whole area of the Nanterre works of the Union des Gaz was submerged, the strikes of gas-workers of the latter at the Italian stations, and the earthquake that reduced Messina to ruins, and has caused the works there of the Continental Union Company to remain ever since practically derelict and lifeless, are matters that—being extraordinary in their character—are fully in the memory of our readers, and therefore we will not iterate the facts concerning them. But there is another side to these matters to which attention may now be directed, as bearing on the effects and the future. The Company have had trouble in the past beyond compare among gas undertakings; and the ugly and costly series of events occurring in such a short space of time has been a tremendous strain on both the administration and the executive officers. In the cases of the strike and floods, the only effects from which the Company are temporarily suffering now are of financial character; but in regard to the strike there is financial and other value in the fact that at the Italian stations the conditions have never been more peaceful, nor the working so good, as at the present time. As to Messina, the fate of the Company's administration of the gas supply there has not yet been decided, and matters hang in a balance for the time being.

But in all these respects, the Board have, and are, facing the position that has been created by the destruction of assets and by necessary expenditure of money with a boldness and tact that will hasten the time when the financial effects of this perfect avalanche of trouble will be completely effaced; and the concern it is hoped—there is, indeed, every prospect, for we cannot point to any single reason to the contrary, other than those incidental and contingent to all trading enterprises—will have a brighter future than ever. Under these circumstances, we have no sympathy with the one or two shareholders who urge the Directors—in fact, it was not politic to publicly do so at the present time—to consider the advisability of getting the capital in hand in hard cash by letting the stock gradually flow on to, and be absorbed by, the French market. The bold and prudent course adopted by the Board, in quickly clearing away the financial encumbrances produced by the troubles of the recent past, has involved the shareholders' dividends. Clip down dividends

even temporarily, and there are almost bound to be stockholders who will at once fall into pessimistic mood, and be prepared to tender advice that, put into execution, might be most unwise and irretrievably disastrous. To do what was suggested by a proprietor when there is a break in the cloud of trouble through which one sees, so far as it is humanly possible to see, fair hope for the future, would, in our judgment, be the height of folly. The stockholder who made the suggestion unconsciously displayed a fair amount of ignorance when he spoke in disparaging terms of the administration from this country of gas concerns carrying on their operations abroad. We look at the position of the Imperial Continental Gas Association, of the European Gas Company, and of concerns carrying on their operations in India and South America, and the conclusion arrived at is that the stockholder in question must have had, upon which to base his judgment, some exceptionally bad experience with concerns that have suffered not through their administration in this country, but through local conditions, the consequences of which a managing body immediately on the spot could not have possibly averted.

It is sincerely hoped that the end of the chapter of difficulty has been reached for the Continental Union Company; and that in the time before them the Directors and the officers will not have falling to their lot more than the normal troubles attending a gas enterprise. Out of evil good may come; and we are looking forward to this being a case in point.

## "Progress" of Electric Lighting.

THE members of the Illuminating Engineering Society on Friday evening last assembled to hear of the "progress" of electric lighting; but the paper by Dr. E. W. Marchant and the discussion were largely directed to defects of the most modern lamps with which the electricity supply industry is out to do business. There is absolutely nothing new in the several points that were largely talked about; but the occasion concentrates them once more. Let us run over some of them. The author of the paper commented upon the fact that flame arc lamps give off a good deal of fume and vapour, and are therefore unsuitable for indoor lighting; so that the developments have been more in the direction of increasing their serviceability for street lighting. In addition to the fumes and vapour, the flickering is against this form of lamp for indoor purposes for which a steady light is essential. As to the outdoor use of flame arcs, Professor Morris mentioned that consideration is now being given, by the authorities of certain docks on the Thames, to the question of the abandonment of that type of lamp in favour of high-pressure gas lighting, on account of the better penetrating power of the latter during the prevalence of white mists, which are the most frequent form of "fogs" on the river. Experience goes farther than all the talk of rival advocates.

On the other hand, there is no question about the steadiness of the light of metallic filament lamps in comparison with that of flame arc lamps. But relative to the metallic filament lamps, two points are now freely admitted: The glare is so great, and the diffusion of the light so bad, that it is necessary to use dioptric globes to tone down the former, and to direct the light where it is required, instead of wasting it in other directions. On the subject of glare, we have Dr. Marchant saying that it is becoming increasingly acknowledged that it is necessary to screen the direct image of the lamp filament from the eye. The intrinsic brilliancy of such an image is very high; and the image formed on the retina is now recognized as producing undue stimulus; and, if often repeated, this may prove most injurious. This implies the necessity of using either a frosted or refracting globe. Then we have Mr. A. H. Seabrook admitting (it was not always so) that some consumers find the use of metallic filament lamps too expensive; and the only means he can discover of producing greater satisfaction is the use of Holophane globes or shades, whereby the rays of light are brought into the required direction, and fewer lamps are necessary to produce the light necessary. But all these defect-curing accessories cause added expense and labour. They require cleaning; and there is the fragility of the filaments when cold to be considered. In paper and discussion, this was a prominent point; and the private user has to be educated up to switching-on his lamps before he ventures to brighten up the glassware. The laboratory long life of these lamps, or the long life obtained in the careful hands of the expert, can only be realized by the private user by considerable nursing, and the avoidance of shocks. Professor Howe introduced another defect of the metallic filament lamp, in describing an interesting investigation into the cause of the blackening of their globes.

These are among the several points that were debated on this evening when the members of the Society assembled to hear of the "progress" of electric lighting. The electricians deserve to be complimented on acknowledging that they are conscious of serious shortcomings in the field of illumination, and that in making progress in one direction they retrogress in others.

## An Experiment with German Coal.

No doubt several of our readers saw an announcement last week in the Daily Press that a collier had arrived in the Thames with a cargo of German coal for the Gaslight and Coke Company; and the intelligence will have raised an amount of interest in the gas industry. As a matter of fact, we learn, on inquiry from the General Manager of the Company (Mr. D. Milne Watson), that this cargo is only one of three or four—amounting in the aggregate to something like 10,000 tons—that the Company have purchased. There is no immediate significance about these purchases; inasmuch as the Company's contract prices are not such that, under reigning circumstances, they can complain of them. But, at the moment, the purchases of German coals are solely for the purpose of obtaining information. The purchases have established the feasibility of bringing German coals up the Thames for delivery at the Company's works; and the relationship between cost on the works and the value of the coal to the Company as makers of gas, coke, tar, and other products is now a matter of trial. In short, the purchases represent a pure experiment on their part.

Results obtained from the native coals under German conditions, in which little or no notice is taken of illuminating power, have of late years been frequently published in our columns, in connection with the development of carbonization systems in that country; and our German friends are also fully cognizant of what British coal will do working under German conditions. But in this country—we suppose the shortcoming must be added to the shoal of other things ascribed to our insularity—there is little or no knowledge as to what German coal will do under our home circumstances; and the circumstances of the Gaslight and Coke Company include penal testing for both illuminating and calorific power. But the relaxation of the illuminating power conditions of the gas industry—relaxation that is year by year being applied to more and more undertakings—has extended the fields from which coal supplies for gas making may be drawn, and therefore the opportunities for bargaining on the part of gas manufacturers. And while it is not at all likely that recourse will be had by gas undertakings in this country to the German coal-fields for their requirements while supply conditions at home are favourable to them, it is as well to be prepared with experimental information as to what can be done here with the coal. That, too, is the view of the Governor (Mr. Corbet Woodall) and the Board of the Gaslight and Coke Company.

## A Specification for Street Lighting.

It will be remembered that, at the recent meeting of the Institution of Electrical Engineers, when Mr. Haydn Harrison's paper was under discussion (*ante*, p. 713), the question was raised as to the absence of any proper specification for street lighting; and it was considered that such a specification should be framed by a Committee representing the various lighting interests and those responsible officials of local authorities who have to advise on the subject of street lighting. The suggestion shows that the specifications for the Westminster and the Calcutta street lighting contracts are not universally considered as fully meeting requirements, though Mr. J. W. Bradley, the City Engineer of Westminster, describes (in a communication to the "Contract Journal") the one he has prepared as, in his experience, "a most convenient and workable one." The main parts of both the Westminster and Calcutta specifications were included in Mr. Jacques Abady's paper read before the Institution of Gas Engineers last June. The interesting announcement was made by the President (Dr. Silvanus P. Thompson), at a meeting of the Illuminating Engineering Society last Friday, that the Council have decided to appoint

a Committee from its own members, with power to consult with others, to draw up, in a preliminary form, an actual model specification for street illumination—something which will serve quite irrespective of any particular interest. In other words, it is proposed that the model specification shall be framed to show borough surveyors and others concerned the proper way to specify how a street is to be lighted, so that it will be known exactly what has to be tendered for. With one or two exceptions, the President pointed out, there have been no proper specifications. The Council of the Society have taken the first step in this matter; but, as the adoption of the model specification will be entirely a voluntary matter, it will be necessary for it to be made as acceptable as possible to all parties. To this end, there should be a fair balance of the interests concerned represented on the Committee; and the representatives should be men fully competent to effectively assist in composing the specification. The model must also be one which will not bring any undue influence to bear upon the responsible officials of local authorities. All that is wanted by the gas industry is a fair field and no favour.

## A Bad Failure.

Even the best regulated electricity supply system is subject to failure. No one can deny the thoroughness of the technical management of the Glasgow Corporation Electricity Department. But, thorough as it is, a trunk high-tension feeder in its distribution system failed last Tuesday evening; and all private houses, business premises, streets, places of entertainment, meeting halls, and railway stations depending solely on electricity were thrown into darkness, and this continued for fully half an hour, at the very busiest part of the evening. Confusion reigned wherever reliance had been placed on the electricity supply; but the dangerous side of such an occurrence as this is the sudden plunging into darkness of streets, railway stations, and places where the public assemble. That is a serious aspect that is all too often overlooked by the authorities responsible for selecting the system of lighting for these places; whereas the protection of the public ought to be one of the first points for consideration. We notice that at the City Hall where a social function was proceeding, at one of the halls where political matters were under discussion, and at a polling-station where a local authority election was taking place at the time, the convenience of gas as a stand-by was proved. They were cautious and thoughtful Scots who retained the means of gas illumination in the places. We notice similar retention in many buildings in London where electric lighting is adopted; the instances of repeated electricity supply failure having undermined the confidence of those who have changed over. In connection with stand-by gas supply for lighting, it will have been noticed that the Swansea Gas Company will seek next session the right to levy a minimum charge.

## The Duties of Auditors.

Some weeks ago, Mr. Charles Duguid, a City writer on financial subjects, gave an address at the London Institution, before the Incorporated Accountants Students' Society of London, in which he dealt with the position and duties of auditors in connection with the certification of accounts of public companies. A few of the points made by the lecturer were referred to in the "JOURNAL" at the time (*ante*, p. 182); and one of these was the need for plain speaking on the part of auditors, whose certificate, he contended, ought to say what it meant, and not merely give hints. Auditors, he urged, existed in a great measure to see that the directors rendered to the shareholders a faithful account of their stewardship—to see that the shareholders were aware of the true position of the business which belonged to them. Turning to another aspect of the question, he expressed the opinion that at the root of any shortcomings there might be in our system of audit, lay the apathy of the shareholder. One suggested change was that auditors should be rendered more independent of both directors and shareholders—that was, that they should be appointed nominally by the shareholders, but not be removable without application to the Board of Trade—and another was that they should receive higher fees. The discussion was postponed; and when it came on recently, the case for the auditors was fully presented. It was argued that any assertion that auditors fell short in their duties to shareholders was, in the main, based on exceptional cases, and that to take a few instances out of the 43,000 companies in this country was not quite fair; while as to speaking out, there was a great responsibility resting on the auditor, as to do so in some cases might endanger the company concerned. "Wise words, well considered and tactfully delivered," it was remarked, "should be the relation between the auditor and the directors; and only when these failed to take effect was it his duty to inform the shareholders." One speaker admitted that the Act of 1900 had done a very great deal to strengthen the position of the auditor; but he agreed with Mr. Duguid that still more remained to be done, and that the auditor's position was now not sufficiently strong. It was right to urge, he added, that the certificate must be frank and full, and that the auditor was paid to state that which he knew, and not to construct such a certificate as, in his opinion, should protect himself. There may in many cases be substantial ground for the complaint of another member that where auditors had done their best to put a concern on a better footing, and to show the shareholders what the position of the company was, they would find the shareholders never supported them. But whether or not there be any serious shortcomings in the existing system, Mr. Duguid's hearers must have taken heart at a statement made by him in the course of his reply to the discussion. This was to the effect that soon after he delivered his lecture he received a communication from the Consul-General of Germany asking for some advice, as the Germans were desirous of modelling their system of accountancy on that in vogue in this country.

## Representation in Parliament.

Following up the information given in the paragraph under this heading last week, we have to congratulate Sir J. Fortescue Flannery, one of the Directors of the South Suburban Gas Company, and a warm friend of co-partnership in the gas industry, upon retaining his seat, as a Unionist, for the Maldon division of Essex. Mr. H. W. Helme, the Chairman of the Lancaster Corporation Gas Committee, continues the representation, in the Liberal interest, of the Lancashire North (Lancaster) division. Sir Henry Kimber, who presided over the Standard Burner Bills Committee of the House of Commons last session, and is a thorough-going Unionist, has increased his majority in Wandsworth (by upwards of 200 votes) to 4439. Sir Philip Magnus, of the City and Guilds of London Institute, returns to Parliament as representative of the London University. He had a strong Liberal opponent in Sir Victor Horsley; but he polled 722 more votes than the latter. Sir Alfred Mond goes back, with an increased majority, for Swansea as a Liberal; and Mr. J. F. L. Brunner, also on the same side, continues to hold the Cheshire (Northwich) division. We sincerely regret that Mr. A. P. Main was unsuccessful in winning the Tradeston division of Glasgow. Sir W. J. Crossley, in the Cheshire (Altrincham) division, has suffered defeat at the hands of his Unionist opponent, but only by 119 votes. By 186 votes, too, Mr. E. A. Brotherton (Unionist) has lost his seat at Wakefield.

## A Fire Canard.

We were afraid, on reading the London papers last Thursday evening and Friday morning, that a disastrous fire at York, on Thursday morning at a large drapery stores, would have to be entered up against an unprotected gas-jet. The building in which the fire occurred was that of Messrs. Boyes and Co.; and it was stocked with highly inflammable Christmas goods. The London version of the story ran that some coloured paper was blown against an unprotected gas-jet, and so a fire was started which gutted the building, and caused an estimated loss of £20,000. Willingly, had there been any proof as to the cause assigned by the London papers being the correct one, we should at once have accepted it, with a feeling of thankfulness that the terrible loss of life of the electrically originated fires at Clapham and Accrington had not been repeated in this instance. But we read in both the "Leeds Mercury" and the "Yorkshire Observer" that, in conversation with their representatives, Mr. Boyes stated that steps had been taken to find out the origin of the fire, but there had been absolute failure. He added, however, "there is no truth in the rumour that the blaze was caused by some Christmas decoration paper being blown against an unprotected gas-jet." It is satisfactory to have such a correcting statement from the principal member of the firm.

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On the invitation of Mr. John Bond, the Manchester and District Junior Gas Association will visit the Southport Gas-Works next Saturday.

## GAS STOCK AND SHARE MARKET.

**(For Stock and Share List, see p. 805.)**

THE Stock Exchange last week was decidedly less cheerful than it was the week before. Business was very quiet; but that is to be expected at the approach of Christmas. Apart from this, the depressing factors were the elections and the weather. The former seemed to be considerably overdone as a motive power; and a seat gained by a Radical was a lever strong enough to mark Consols down a fraction. Railways had to contend against an almost incessant rainfall and a terrible accident; and they stood up against these influences very well considering. The opening on Monday was not promising. "Majorities" was the chief line of interest, and over-sanguine backers of the Unionist cause were plunged in despondency. Consols were put down ½. Rails were weak in sympathy. The tone on Tuesday was much the same, with dulness and depression. Consols fell another ⅜; and the general tendency in most departments was adverse. On Wednesday, after some nervousness, markets began to recover their calm, and prices mended a little. Consols were ⅛ better, and Rails were firmer. The restored cheerfulness brightened Thursday's business, what little there was. Government issues were strong, Consols rose ¼ for money and ⅛ for the account, and Rails made several moderate advances. Business was very slack on Friday, and the tendency was dullish, with some realizations. Disappointment was expressed at the Bank rate not being lowered. Saturday was as quiet as could well be, with little movement; but Consols were ⅛ lower. In the Money Market, the supply was very abundant on easy terms; but discount rates hardened towards the close. Business in the Gas Market showed reanimation in point of activity; and several issues were freely dealt in. Unvaried firmness was the general characteristic. There were only two or three changes in quotation; and they were for the better. In Gaslight and Coke issues, the ordinary was pretty active and quite firm—all transactions lying within the limits of 105¾ and 106½. In the secured issues, the maximum changed hands at 87¼ and 88, the preference at from 103¼ free to 104, and the debenture at from 80¼ to 81½. South Metropolitan was unchanged at the old figures of 121½ to 122½, with 81½ for the debenture. In Commercials, there was one bargain in the 3½ per cent. at 101¾. Among the Suburban and Provincial group, Brentford old was done at 249, Brighton ordinary at 161, British at from 44 special to 44¾, and Tottenham "B" at 113½. Ilford "B" rose 2, without business marked. In the Continental companies, Imperial marked from 185½ to 186½, ditto debenture 94⅞ and 95½, Union 88 and 89, European fully-paid 23¾ and 23 15/16, and ditto part-paid 17⅞ special and 18. Among the undertakings of the remoter world, Melbourne 4½ per cent. changed hands at 100⅛, Primitiva at from 7¼ to 7 13/32, ditto preference at from 5 3/16 to 5⅜, and ditto debenture at 96½.

## ELECTRICITY SUPPLY MEMORANDA.

**Critics of the Lighting at the Institution of Electrical Engineers—Glare and Excessive Local Illumination—Where is the Joint Wiring and Fittings Bill?—Electric Supply Proposals for Next Session—Animation Produced by Modern Gas Lighting—A Lesson for Gas Companies.**

AMONG places in which there should be model electrical illumination right away from the start, the new home of the Institution of Electrical Engineers should assuredly stand first. But from what we read, the electrical experts who have had this matter in hand have not been successful in pleasing everybody. That is often the case in electric lighting—the counsellors, as a rule, being very strongly addicted to under-estimating the quantity of light that is really required. That is the sort of thing that has grown on them through the pinch, which they feel most acutely, of the economy of incandescent gas lighting. The difference between us is that electricians prescribe as sufficient as little light as possible where it is a question of competition, in order to cut down cost, while the gas industry offers an abundant light at a low expenditure. They seem to have been letting custom dominate plans in fitting up the new home of the Institution of Electrical Engineers; and there is not, as observed already, universal approval of what has been done. Therefore at the present time the place is not at all exemplary in the matter of lighting; and there is a prospect of alterations being made. After this, there will be need for caution in putting faith in the advice of electricians who have failed, at the outset, to put their own house in order in respect of illumination.

There is in the last number of "The Illuminating Engineer" a criticism of the lighting in the form of a hypothetical conversation between an electrical engineer, a philosopher, a man of sense, and a lighting expert. The man of sense seems to have much gratification in finding that, in the lecture theatre, "the beastly glaring metallic filaments have been kept out of sight." This is Limehousing with a vengeance; but the electrical engineer does not, in print, appear to take the "whip lash" at all amiss. On the contrary, he seems to consider the recognition of the act of hiding the lamps along the cornice, and reflecting the light, as a compliment completely outweighing the uncomplimentary description of the lamps themselves. Then there is a square centre illuminated by outside mercury lamps, which is intended to serve "to break up the ceiling, and prevent monotony." The general effect is described by the critics as "spectacular—not to say theatrical." It is also considered that the place looks "empty, depressing, sombre, and dismal." It may be believed that "the impression of 'something wanting' springs from the fact that there is no one point to which attention is involuntarily directed. The President's chair ought to be such a point; and it ought also to be possible to give special local lighting to diagrams." Passing into the Common Room, the philosopher complained of the obvious solidity and the low position of the fixtures there. In the Library, there are pendant lights above the gangways; and both the man of sense and the philosopher complained that they had not enough light at the centre table by which to read. This demonstration of the art of illumination as pursued by electrical engineers will no doubt undergo a little revision so as to fine-down the opportunities for critics.

But electrical engineers are in the habit of practising the "art" of illumination to suit their own special conditions and convenience rather than stick to the letter of correct principles. They have agreed that, for their own lecture theatre, the proper thing is to keep the "beastly, glaring metallic filaments out of sight." They would probably recommend the same system of reflected illumination in Belgravia, or for mansions elsewhere, where expense is no great object. To other patrons who would perhaps object to the constant greater expense of reflected lighting, electrical engineers would recommend some of the prismatic globes to break down the glare. But where they want to do business, and economy is an object, the question of the glare of metallic filaments, and the injurious effect on the eyes, do not disturb their consciences. The same in shop lighting. Tradesmen may have three or four flame arcs along a ten or twelve feet frontage, a couple of feet or so above the eyes of pedestrians and almost horizontal with the eyes of travellers on passing omnibuses; but never a word of protest from the electrical engineer as to this being opposed to the canons of correct illumination, and as to it causing physical discomfort to people using the footways and passengers on the tops of popular means of locomotion. The commercial influence is stronger than scientific rule or propriety. In street lighting, too, there is now a disposition, in order to obtain the full strength of the flame arc in meeting the competition of high-pressure gas lighting, to use plain globes. This is not right; and local authorities should not tolerate it, any more than they should tolerate excessive local illumination, with all around on a considerably lower scale. We were protesting just recently against the proposal of the crest-fallen St. James' and Pall Mall Electric Company to put in Piccadilly Circus—free of all cost to the ratepayers for five years—three groups of four 3000-candle power flame arc lamps on high standards above the high-pressure inverted gas-lamps that are being supplied by the Gaslight and Coke Company, each of which is on a single column. The electrical proposal—the issue of fright and reproach—is, to say the least, a ludicrous one. To have such an amount of light concentrated in one position would be harmful, and would create an altogether false impression as to the illumination of streets in the vicinity. An extreme of illumination in one place gives an idea of insufficiency in the surrounding parts; whereas it is the excess that is in fault. Besides, there is danger in what is proposed. "There is," as we were saying recently, "danger in having too much light in one place where there is a lot of vehicular traffic;" and if the Electric Company are allowed to carry out their project for overpowering the gas-lamps by sheer force of light concentration from a number of high-power units in excess of the gas-lamps, "Piccadilly Circus may find itself overdone with illumination."

On our contention, this is the brilliant and philosophic comment of "Meteor" in the "Electrical Times": "As to the surfeit of illumination, if too much light is dangerous, even when 30 feet above the observer's eyes, there should be grievous accidents on those rare days when the sun shines. Yet we recollect no placards announcing 'Bright Sunshine in Piccadilly Circus; Horrible Accidents.'" The St. James' and Pall Mall Company are not proposing to do what Old Sol does. He gives light without favour; and he does not concentrate a powerful amount on Piccadilly Circus, with a smaller allowance for the streets converging upon it. "Meteor" has already forgotten some of the contents of the recent special outdoor lighting number of the "Electrical Times," over the preparation of which he groaned on account of the hard labour involved. It is convenient sometimes to have a short memory. Nor can we think it possible that he has yet been received into membership of the Society for the spread of the doctrine of illuminating chastity, or he would never support such a piece of illuminating barbarity as is projected by the St. James' and Pall Mall Company. On the contrary, he would endorse these words from one of the leading articles in the December issue of "The Illuminating Engineer": "For our part, we are convinced that in the near future the discussion of what constitutes good lighting will turn more and more on this question of avoiding badly-placed and inconveniently brilliant lights. The tendency in this direction is accentuated still further by the change in the nature of traffic and the increased speed of mechanically-driven vehicles. Conditions of lighting which dazzle the eyes of drivers and bewilder pedestrians might have been tolerated a few years ago, but are too dangerous to be acquiesced in now. It may therefore be anticipated that authorities concerned with traffic regulation will pay an increased amount of attention to street lighting." Enough is said.

Has that long-talked-of promotion by the Incorporated Electrical Municipal Association, to confer freedom upon municipal authorities in the matter of wiring and fittings speculation, gone astray? We have not seen any notice of it among the projected electrical legislation for next session; so that it looks very much as though it has been dropped for the present. There would be no surprise if it had been. It has had a mixed reception; not the least distinguished feature about it being the liberal manner in which sympathy, instead of hard cash, has been voted towards the support of the measure. Nothing short of a substantial guarantee fund is required for a Bill of this kind, which is bound to be strongly opposed at every stage of its career; for there is no telling at the inception of such a measure what will be the total amount ultimately standing at the foot of the bill of costs. Some of the local authorities who entered into joint opposition to the Standard Burner Bills last session have been "staggered" by the sums they have been called upon to pay for appearing at Westminster, and dancing to the tune chosen by Liverpool. The caution that has been displayed over the matter of promises of financial support for the electric wiring and fittings measure indicates a curious twist in the minds of local authorities in regard to the matter. They are apparently not willing to speculate heavily over the obtaining of parliamentary sanction; but they are quite prepared to speculate freely in wiring and fittings when sanction is obtained.

The applications for electric lighting powers of which notice has been given for next session are not striking in their character. There is intimation as to 33 Provisional Orders—thirteen by local authorities and twenty by companies; while the notices of Bills of four local authorities and two companies foretell clauses bearing upon electric lighting. In most cases, however, these are extensions of existing powers. There are at least three projected transfers. Callender's Construction and Cable Company are willing to take possession of the ill-fated Uxbridge concern; the Metropolitan Electric Supply Company are prepared to lift from the shoulders of the harassed District Council of Acton their electricity supply undertaking; and the Winchester Corporation are desirous of becoming possessed of the local Electric Light and Power Company's property and business. The fever of electrical speculation has so got hold of the Bermondsey Borough Council that they now desire to include in their area of supply certain portions of the borough at present served by Companies. This means competition. The Corporation of Gloucester desire their generating station and refuse destructor to be exempt from proceedings for nuisance. That is a remarkably brilliant idea. Several promoters are asking for wiring and fittings powers. Among gas undertakings, the Sidmouth Company are requesting electricity supply powers; the Ashbourne and Chapel-en-le-Frith Companies are desirous of authorization to make application for Electric Lighting Orders; and the Swansea Gas Company are requiring the right to make a minimum charge for the provision of a gas supply to a consumer using electricity for lighting purposes. From this projected legislation, there will not arise an inordinate amount of excitement.

The future historian of the electricity supply industry, looking back at these times, will have something to say, perhaps a little sarcastically, about the schemes of electrical tariff reform that most central station engineers of this period indulge in at some time or other of their career. To have a pet scheme has grown almost a mania in the industry's professional ranks; and there is in the fact the testimony to their difficulty of extending (at ordinary prices) business in heating, cooking, and so forth through the poor thermal duty of electricity. Mr. Lackie, the Electrical Engineer of the Glasgow Corporation, has reported on the need for a supply of energy for domestic use other than lighting, with a view of saving the cost involved in the separate wiring and meter; and he believes that the lower charge necessary may easily be arranged by an adaptation of the maximum demand method of charging. As the result of looking into the matter, he supplies a useful maximum demand hours' figure. From an examination of a large number of accounts of domestic consumers covering the past three years, he finds that these accounts are practically stable from year to year, and even in the corresponding two-monthly account periods of different years. The examination shows that the maximum demand quantity of domestic consumers averages 800 hours' use of the maximum demand per annum. The present charge to domestic consumers is a flat-rate of 3d. per unit; and he suggests that they be charged a maximum demand rate of 3d. per unit for 800 hours' use of the maximum demand—all current consumed over this quantity being charged out at 1d. per unit. Further, he proposes that the initial charge for the first 800 hours' use of the maximum demand should be on the principle of a proportionate number of 3d. units in each two-monthly account period; all the units consumed over this fixed quantity in the period being charged at 1d. This would let the consumer see in every account that, as a result of using energy for other than lighting purposes, so many units were charged at 1d. The division of the 800 hours' use of a maximum demand over the six periods into which the year is divided would be as follows: June-July, 40 hours' use of maximum demand at 3d. per unit; Aug.-Sept., 60; Oct.-Nov., 200; Dec.-Jan., 300; Feb.-March, 160; and April-May, 40—total 800 hours. All above would be at 1d. per unit. The idea is, of course, to save the expense of duplicate wiring and meter, and to regard the 800 hours' maximum demand as representing the lighting, and all over that the cooking and heating consumption.

Still further evidence of how keenly alive our electrical friends are as to the necessity—being face to face with demonstrations of latter-day street lighting by means of high and low pressure inverted gas-lamps—of scrapping old type electric lamps, and having nothing but the very best of flame arc lamps or high-power metallic filaments in the effort to match gas lighting. Mr. Leon Gaster and "Meteor" in the "Electrical Times" have just been aiming point-blank at the ghostly open-type arcs that are still doing duty on the Embankment, and urging their removal. The "Electrician" also says there can be no two opinions as to the advisability of electric supply authorities replacing the old types of arc lamps. But it suggests that possibly some of the authorities are undecided as to whether to instal flame arc lamps, or to change over to metallic filament lamps. We hope the state of indecision will continue; the longer, the better for the gas industry, as it will intensify the reasons for changing to incandescent gas lighting *à la mode*, which has had a peculiarly animating effect upon some of our electrical friends. On the point of the uncertainty as to whether to change over to flame arcs or metallic filaments, we have recently had an opportunity of inspecting a main road in which electric arc lamps have been superseded by lamps each containing a cluster of three metallic filaments. The lighting of the road is about as disgraceful as the "lighting" can be of a main road with trams running through it. The density of the shade between the lamps would send a shiver up the backs of illuminating engineers with electrical inclination who preach the doctrine of a minimum candle-foot allowance of light, and the reduction to the finest possible degree of the margin between maximum and minimum. But we have not heard quite so much about this sort of thing lately, since it does not fit in very well with the best of the lamps on offer by the electrical industry. On the contrary, the beauty of spot intensity and the restfulness of a little shade, instead of a monotonous uniformity, is now being talked about. We have failed to find any monotony about a road lighted in a fairly uniform manner; and we have regarded such a road as offering considerable safety to the public.

However, it is not only the electric supply authorities who have to wake up. There was an article recently in our Editorial columns which showed that there is not a little that is antiquated in existing street gas lighting; and we ventured to exhort gas companies to wake up in this matter, and to show the lighting authorities what can be done by new gas-lamps. We are reminded of this by a paragraph referring to the lighting of Ashstead. The local authority, it is understood, have transferred their business in this direction to an Electric Lighting Company supplying in the district; it being alleged that the Gas Company concerned have done absolutely nothing until the Electric Lighting Company sent in a tender. We do not know whether or not this is true; but exhibiting an interest in the question after an electric lighting company have been stirring things up appears to us to indicate a miscalculation as to the proper time for action. In these matters, it is better to be first in the field. It creates a good impression.

## Glover-West Vertical Retorts at Manchester.

The installation of the Glover-West vertical retorts erected at the Droylsden Gas-Works of the Manchester Corporation has now been in continuous operation for more than five months; and we learn from the Chief Engineer, Mr. J. G. Newbigging, M.Inst.C.E., that from the date the plant was started the old retort-house has been put out of operation, and the vertical retort plant has supplied the whole of the gas to the Droylsden district without any assistance from the main supply. A number of tests have been carried out on local and well-known coals, and excellent results have been obtained with a fuel consumption varying from slightly over 9 lbs. to well under 11 lbs. of coke per 100 lbs. of coal carbonized. The alterations in details which have been introduced into the plant, as the outcome of the experience in connection with the first plant at St. Helens, have conduced to improved carbonizing results in every respect, compared with those produced in the several tests carried out at St. Helens—especially in respect to the fuel consumption, calorific value, and illuminating power.

**Institution of Civil Engineers.**—At the ordinary meeting of the Institution last Tuesday, Mr. Samuel Glover, Gas Engineer to the St. Helens Corporation, and Mr. J. W. Morrison, Engineer of the Sheffield Gas Company, were elected members.

**Concrete Supports for Water-Pipes.**—The Water Committee of the Birmingham Corporation report that the works undertaken last year for the strengthening of certain sections of the Severn syphon by filling in concrete under the pipes, have proved entirely successful; no bursts having taken place on any of the sections. The total number of bursts during the past summer showed a large reduction. The Directors of the Great Western Railway Company have called attention to two short lengths of pipes at present unprotected by concrete on the steep ground to the east of the Severn Valley Railway; pointing out that any serious burst on this section of the aqueduct might be attended with grave consequences. In view of the experience of the effective protection afforded by the concreting carried out last year, the Water Committee have resolved to undertake the concreting of these lengths by way of precaution.

## PERSONAL.

### JUBILEE OF MR. WILLIAM W. DRORY AT FRANKFORT.

In October, 1903, we had the pleasure to chronicle the celebration by Mr. William Wolverley Drory, the Manager of the Frankfort station of the Imperial Continental Gas Association, of the fiftieth anniversary of his entry into the service of the Association. Since that date, the Frankfort branch has been amalgamated with the local Frankfort Gas Company, and Mr. Drory has remained in harness as one of the Joint Managers of the new Company. It falls to the lot of few men to celebrate the completion of fifty years of active service, and to fewer still to celebrate fifty years' tenure of the responsible post of Manager in one and the same town. Mr. Drory, however, is now in the happy position of being able to do so, for he completed yesterday fifty years' service as Manager of the Frankfort Gas-Works, having been appointed to this position on Dec. 12, 1860, at the age of twenty-five. The gas engineers of those days had not the advantages of technical colleges and other aids to the acquirement of a knowledge of their profession, but had to grow up with their business, and gain their knowledge and experience while carrying it on. There are, we think, not many men of the present day who can boast of being appointed as manager of the gas-works in so important a city as Frankfort at so early an age. As an indication of the changes which have occurred during Mr. Drory's fifty years' managership, we may mention that in 1860 the annual quantity of coal carbonized at Frankfort was about 5200 tons, while it is now in the region of 125,000 tons.

Though Mr. Drory can look back on an unbroken service of fifty-seven years, which must constitute almost, if not quite, a record in the gas profession, he does not regard his career as closed, for he is now engaged on the task—by no means a light one—of constructing a large modern gas-works in the Osthafen district of Frankfort. We feel sure his many friends will join with us in congratulating him on this occasion, and in wishing him continued good health in order that he may have the satisfaction of being able to remain at the helm until the completion and putting in action of the new works he has in hand.

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We are pleased to learn that Mr. Frank H. Robinson, whose papers on the new tank and gasholder at Manchester—the former given in the "Journal" for Nov. 30, 1909, and the latter elsewhere in the present issue—have furnished evidence of considerable ability, was on Friday appointed Manager of the Knutsford Gas and Water Works, and will enter upon his duties next Monday. He was educated at the Manchester Grammar School, and received his professional training in the office of Messrs. Thomas Newbigging and Son, with whom he was for three years. During the past seven-and-a-half years, he has been Engineering Assistant to Mr. J. G. Newbigging, M.Inst.C.E., the Gas Engineer to the Manchester Corporation; and in this capacity he has had charge of work costing about £75,000. Mr. Robinson, who is twenty-six years of age, is an associate member of the Institution of Civil Engineers. We cordially wish him success in his new sphere.

## OBITUARY.

News has only just reached the German Technical Press of the death, on Oct. 23, of Herr Ernst Buhe, the Manager of the Duisburg Corporation Gas, Water, and Electricity Works.

We regret to learn, from the "Journal für Gasbeleuchtung," of the death, on the 1st inst., through an apoplectic seizure, of Herr Richard Bremer, the Engineer and Superintendent of Public Lighting to the City of Berlin. Deceased had attained his 57th year.

The last number to hand of "Het Gas" reports that Heer F. C. Steigerwald, formerly Chief Inspector of the Rotterdam Gas-Works, died on the 3rd ult. Deceased (born in 1836), after some years' work in a sugar refinery, entered the Rotterdam Gas-Works in 1860, to take charge of the steam-engines, &c., and was subsequently promoted to the position of Manager of the Oost-Zeedijk station. He retired, on pension, in 1907, after 47 years in the service of the gas undertaking. He was greatly esteemed and respected by his colleagues in the gas industry in Holland.

Mr. James Cox, aged 57, who was connected with the Gosberton Gas-Works, met with his death under sad circumstances some days ago; being scalded as the result of hot clinker falling out of the furnace into water below. After the accident, he was removed to the Spalding Infirmary, where death took place. An inquest was subsequently held, when evidence was given that deceased had made the following statement: "Before cleansing the fires, the fire-bars had to be removed. A clinker fell into the water in the pit beneath the bars, exploding. The steam was considerable." Medical evidence was to the effect that Mr. Cox was very severely scalded; and the cause of death was shock, due to the injuries. A verdict of "Accidental death" was returned.

The death is recorded, after a brief illness, of Mr. Francis Russell Hartley, Deputy-Engineer at the Salford Corporation Gas-Works, at his residence in Pendlebury. Mr. Hartley was at the works as usual on Friday, the 2nd inst., appearing to be in perfect health. On reaching home in the evening of that day, however, he had a seizure, from which he never rallied; dying just two days later. He had been in the service of the Salford Corporation Gas Department for 22 years; and the news of his sudden demise was received with much regret by his colleagues at the works and a large circle of private friends. The late Mr. Hartley was the eldest son of Mr. Charles James Hartley, Chartered Accountant, of Birmingham, and served his apprenticeship at the Atlas Foundry in that city. Subsequently he went to New York to fill an appointment with Messrs. Hoe and Co. On returning to England, he took up duty at the Saltley and Windsor Street Gas-Works, Birmingham, and later entered the service of the Manchester Corporation Gas Committee. Then he was engaged with the Lancashire and Yorkshire Railway Company, and afterwards went to Reading. Subsequently he joined the Salford Corporation gas-works staff, under Mr. S. Y. Shoubridge; and when Mr. W. W. Woodward was appointed Engineer to the Gas Department, Mr. Hartley was made Deputy Engineer. The funeral took place last Wednesday afternoon at St. John's Church, Pendlebury, and was attended by a number of officials of the Salford Corporation, including Mr. Woodward, the Engineer, the foreman and workmen at the carbonizing department of the Bloom Street works, and members of the staffs at Liverpool Street and Albion Street.

## WILLIAM YOUNG MEMORIAL LECTURE FUND.

### Final List of Contributions.

We learn from Mr. Alexander Bell, of Peebles, the Hon. Secretary and Treasurer of this fund, that the preliminaries in connection with the memorial are completed, and that the deed of trust has been executed and duly registered. The following is the

Final Subscription List.

| | £ | s. | d. |
|---|---|---|---|
| Total of second list (see "Journal" for July 19) | 422 | 19 | 0 |
| North British Association of Gas Managers | 105 | 0 | 0 |
| Dr. George Beilby, F.R.S., LL.D. (second donation) | 47 | 10 | 0 |
| John Dennis, Bonnyrigg (second donation.) | 5 | 8 | 0 |
| Alder and Mackay, Edinburgh | 5 | 5 | 0 |
| W. R. Herring, London | 5 | 5 | 0 |
| Selkirk Gas Company | 5 | 5 | 0 |
| John Hammond, Eastbourne | 5 | 5 | 0 |
| Peebles Town Council (second donation) | 5 | 5 | 0 |
| R. M. Sutherland, Falkirk | 5 | 0 | 0 |
| R. Forbes Carpenter, London | 3 | 3 | 0 |
| G. R. Hislop, Paisley | 3 | 0 | 0 |
| Lawrence Hislop, Uddingston | 2 | 2 | 0 |
| Lochgelly Gas Company, Limited | 2 | 2 | 0 |
| S. B. Langlands, Glasgow | 1 | 1 | 3 |
| David Easson, Selkirk | 1 | 1 | 0 |
| J. W. Broadhead, Elland | 1 | 1 | 0 |
| John Young, Glasgow | 1 | 1 | 0 |
| Alexander Ross, Burntisland | 1 | 1 | 0 |
| J. G. M'Geachin, Dumbarton | 1 | 1 | 0 |
| R. & G. Hislop, Paisley | 1 | 1 | 0 |
| Bo'ness Gas Company, Limited | 1 | 1 | 0 |
| James Bell, Kirkintilloch | 1 | 1 | 0 |
| John Barker, Nairn | 1 | 1 | 0 |
| Stonehaven Gas Company | 1 | 1 | 0 |
| Executor of the late Alex. Bell, Sen. | 1 | 1 | 0 |
| George Hands, London | 1 | 1 | 0 |
| William Taylor, Forres | 1 | 0 | 0 |
| P. R. Chalmers, Kelso | 1 | 0 | 0 |
| Archibald Leitch, Baillieston | 1 | 0 | 0 |
| Thomas Lindsay, Gourock | 0 | 15 | 0 |
| F. H. Lamb, Manchester | 0 | 10 | 0 |
| Forbes Waddell, South Queensferry | 0 | 10 | 0 |
| H. G. Ritchie, Fraserburgh | 0 | 10 | 0 |
| Alexander Munn, Glasgow | 0 | 10 | 0 |
| Andrew Taylor, Glasgow | 0 | 7 | 6 |
| Alexander Bishop, Newtongrange | 0 | 5 | 0 |
| Frank Carlow, Renton | 0 | 5 | 0 |
| Samuel Glover, St. Helens (extra) | 0 | 5 | 0 |
| Total | £642 | 19 | 9 |

A sum of £650 has been invested in the 3 per cent. debenture stock of the North British Railway Company, and the income will be devoted to the Memorial Lectures, which will be delivered every alternate year.

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The marriage was lately solemnized in Paris of Mr. Charles W. Bland, Managing-Director of the Bland Light Syndicate, with Miss Retta Pavey, only daughter of Mr. J. Pavey, of 8, Boulevard Flandrin, Paris.

In the course of a paper, entitled "The Working of the Road Development Act, 1909," read at the meeting of the Society of Engineers, on Monday of last week, by Mr. Reginald Brown, the author pointed out that to tar macadamize the whole of the urban roads in England and Wales would cost very little more than at present if highway expenditure were equalized. If this cannot be done, then a contribution of £30,000 per annum would ensure the provision of dustless roads so far as urban main roads are concerned. Rural main roads at present need only be tar-dressed.

## STATISTICS OF WORKMEN'S COMPENSATION.

Some of the principal points from the first part of the Home Office Blue-Book for 1909 upon the Workmen's Compensation and Employers' Liability Acts were noticed in the "Journal" a short time ago (*ante*, p. 556); but these dealt only with statistics of compensation under the 1906 Act—that last passed—in cases occurring in certain specified industries. There is furnished in Part II. of the Blue-Book the customary information with regard to the general administration of the 1906 Compensation Act and the Employers' Liability Act of 1880; and from this portion some of the figures may now be given. The matters referred to in this portion of the returns are: Cases coming for arbitration before the County (in Scotland, the Sheriff) Courts; those in which memoranda recording agreements or awards by committees or private arbitrators under the Workmen's Compensation Acts are registered in the County or Sheriff Courts; those under the Employers' Liability Act; those taken to the Appeal Courts; and the use made of the services of Medical Referees. The "contracting-out" schemes certified by the Chief Registrar of Friendly Societies are, of course, set forth separately, in the annual report dealing with these organizations. The portion of the Home Office statistics now under notice is divided into three sections, covering respectively England and Wales, Scotland, and Ireland.

Referring first of all to England and Wales, it is seen that in the year 1909 the number of cases actually dealt with under the Workmen's Compensation Act of 1906 by County Court Judges and by County Court Arbitrators was 4390; and of these 4201 were decided by Judges, and 42 by Special Arbitrators, while 147 were settled by the acceptance of money paid into Court. In addition to the cases adjudicated on, there were 1798 that were withdrawn, settled out of Court, or otherwise disposed of in such a way as not to enable the officials of the Court to state definitely the results. This makes the total number of cases taken into Court, under the 1906 Act, 6188—as against 5358 in the previous year. Besides the cases under the 1906 Act, there were, however, a small number outstanding under the earlier Acts which were also dealt with. In 129 of the cases last year, compensation was claimed for incapacity due to industrial disease. With reference to the decisions come to, it may be remarked that of the claims settled within the cognizance of the Courts, the decision in 2427 cases was in favour of the applicant, and in 660 in favour of the respondent. Thus the proportion of successful claims was 79 per cent., which compares with 82 per cent. in 1908, 84 per cent. in 1907, and 83 per cent. in 1906. The number of cases in which compensation was awarded (under the 1906 Act) on account of the death of workmen was 750; and in all except nine of them the deceased had left dependants. Excluding these nine, the total amount of compensation awarded in the 741 cases was £117,844, or an average of £159 per case. These figures compare with 772 cases in 1908, with a total award of £128,340, or an average of £166 per case. In addition, compensation was awarded last year on account of death, under the earlier Acts, in four cases, to the total amount of £535, or an average of £134 per case. In the previous year there were 30 such cases, with a total award of £4004, or an average of £133 per case. The average figures for the last five complete years under the earlier Acts (exclusive of the few cases in which the deceased left no dependants) were: Number of cases, 426; total compensation, £78,097; average compensation, £183. Of the 741 cases in 1909 in which compensation was awarded to dependants under the Act of 1906, there were 303 in which sums of less than £150 were awarded—namely, cases of partial dependency; the total amount being £19,543, or an average of £64 10s. per case.

With regard to the cases of injury, the assignment of a weekly sum was again the most general method of compensation adopted; there having been, under the 1906 Act, 1244 cases in which a weekly payment was fixed, as compared with 433 in which the compensation was returned as consisting of a lump sum. In 88 of the cases in which a lump sum was paid, the claimants accepted amounts paid into Court; while in the majority of the remaining instances, a lump sum appears to have been awarded by consent of the parties. The average amount of the compensation was £25 18s. 9d.; whereas the average figures for the last five complete years under the earlier Acts were: Number of cases, 113; average amount of compensation, £34. In the instances last year in which a weekly payment was awarded, the average compensation was for cases of total incapacity, 12s. per week; and partial incapacity, 9s. 6d. The cases taken into Court last year are classified under seventeen heads; the list and the number of cases under each head being as follows: Professional employments, 29; commercial occupations, 12; shop assistants, 118; domestic servants, 432; seamen, 359; fishermen, 19; agriculture, 265; building, 637; factories and workshops, 1820; docks, wharves, and quays, 315; mines, 1255; quarries, 87; constructional work (excluding buildings), 177; railways, 176; inland transport by road, 379; inland transport by water, 48; miscellaneous, 60. As compared with the preceding year, these figures show an increase of about 400 under factories and workshops, and 200 under mines; and there were also smaller increases in most of the other classes.

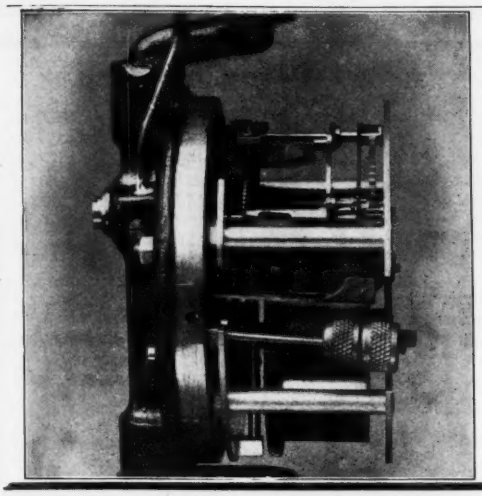
Instances in which memoranda were registered in County Courts, having reference to cases settled by agreement, by committees, or by arbitrators, are set forth in the next table. It is, however, pointed out that these cases represent only a small proportion of those in which compensation is settled by agreement. According to the table, the registrations under the 1906 Act of cases settled were: By agreement, 18,073; by committee of employers and employed, 124; and by an arbitrator, none. The corresponding figures for the last complete year under the earlier Acts were: 5096, 68, and 7. In these agreed cases in 1909, the average compensation to dependants in connection with fatal accidents was £175; and the average weekly payment in cases of incapacity, 13s. 5d. For the last five complete years under the earlier Acts, the average payment in the event of death was £160; and in cases of incapacity, 13s. 1d. per week. The number of cases of incapacity last year under the Act of 1906 in which the memorandum registered was for a lump sum and not a weekly payment, was 5321, as against 5668 in which a weekly payment was agreed upon. The remaining cases were in connection with various points (mainly the agreement of a lump sum in redemption of weekly payments) which do not fall to be included under either of the two headings named. The average lump sum payment over the 5321 cases was £28 0s. 7d. The figures under the different classes of employment, however, vary widely. Docks, wharves, and quays once more show the lowest average lump sum payments for accidents in connection therewith (£11 19s. 2d.); while mines are at the top of the list (£57 2s. 2d.), and next come commercial occupations (£47 6s. 1d.). In practically every class the average lump sum payment is higher on the present occasion than was the case twelve months ago. Factories and workshops, under which are included 1570 of the cases of commutation, have an average of £29 18s. 1d., as against £19 7s. 6d. in 1908.

Turning now to the Employers' Liability Act, which is dealt with in the report upon as nearly as possible the same lines as the Compensation Act, but in a simpler manner—firstly, because all cases except those removed to the High Court are decided by the County Court (there are no arbitrators), and, secondly, because the damages awarded can always be stated as a lump sum. The number of actions brought under the Employers' Liability Act has since the passing of the first Compensation Act shown a continuous falling off; and this decline has been very marked during the last two years. In 1897, there were 688 cases; in 1907, 393; in 1908, 260; and in 1909, 204. Of last year's actions, 67 resulted in judgment for the plaintiff, 26 in favour of the defendant, and 111, or more than 50 per cent., were "otherwise disposed of." The total amount of damages awarded was £4997. Of the 67 cases in which judgment was given for the plaintiff, only three were in connection with fatal accidents; the total compensation awarded being £489. There were 40 cases of total incapacity, with compensation of £3174, or an average of £79 per case; and 24 of partial incapacity, with compensation of £1334, or an average of £56 per case. In about 10 per cent. of the total cases in 1909, though the proceedings were originally taken under the Employers' Liability Act, the question of compensation was actually determined under the Compensation Acts. The average amount of damages recovered last year under the Employers' Liability Act in the three cases of death was about £163, as compared with £159 under the Compensation Acts. The average amount of solicitor's costs under the former Act was, however, £25 18s., as against £11 17s. 10d. under the latter.

The number of cases that were last year carried to the Court of Appeal in England under the Compensation Acts was 135, or just over 2 per cent. of the cases that came before the County Courts. Of these, 68 were appeals by workmen, and 67 by employers. On each side, 23 were successful; while 25 appeals were abandoned, withdrawn, or settled out of Court before the hearing. There were two appeals to the House of Lords, one of which was by a workman. Neither was successful. The number of appeals under the Employers' Liability Act was four, of which two (by employers) were successful. Out of 110 cases in which the point on which the appeal arose is known, no less than 33 turned on the meaning of the words "accident arising out of and in the course of the employment." In four actions, the definition of the term "dependants" was at issue; and in two others, the meaning of the words "wholly or in part dependant." Six cases turned on the definition of the word "workman." Another case had reference to a contract by a domiciled and resident Englishman to work abroad for an English company; the point being whether the Act was operative outside the confines of the United Kingdom. The employers appealed; and their appeal was allowed.

Dealing with the Scottish returns, it is stated in the report that during 1909 the number of cases taken into Court under the Compensation Acts was 1205 (compared with 1026 the previous year); and under the Employers' Liability Act, 92. The average amount of compensation paid in case of death where dependants were left was £137 0s. 2d. in cases decided in Sheriffs' Courts under the Compensation Acts, and £185 10s. 6d. where memoranda were registered. In cases of incapacity, the lump-sum figures were respectively £9 0s. 1d. and £14 12s. 1d.; and the weekly payments were 12s. 11d. and 13s. 5d.

In Ireland last year there were 920 cases taken into Court under the Workmen's Compensation Acts, and two under the Employers' Liability Act. The average amount of compensation in cases of death where dependants were left was £130 2s. 8d. when decided in the County Courts under the Compensation Acts, and £132 19s. where memoranda were registered. In connection with claims for accidents causing incapacity, the lump-sum figures that were awarded were respectively £17 7s. 10d. and £22 17s. 1d.; and the weekly payments, 8s. 6d. and 10s. 5d.



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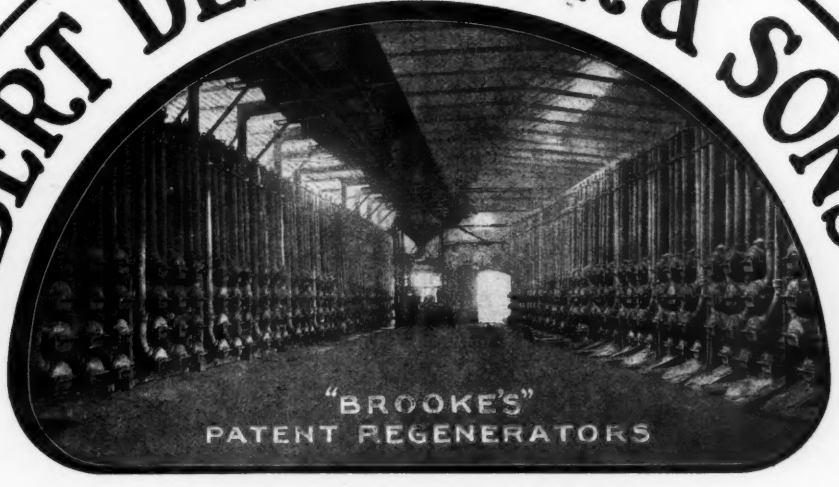


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# THE LATEST GAS UNDERTAKINGS RETURNS.

**Particulars as to Water Gas and Other Gas-Making Materials.**

In the last number of the "JOURNAL," we gave some of the principal figures from the latest published returns as to the gas undertakings of the United Kingdom—viz., for the year ended Dec. 31, 1909, in the case of Companies, and to March 31 last for the Local Authorities.

As usual, the returns contain particulars in regard to the proportion of water gas used, and also indicate the undertakings in which materials other than coal are employed in the manufacture of gas. The following is a list of the Companies and Local Authorities making water gas: the figures in parentheses showing the maximum proportions (except where averages are stated) of its admixture with coal gas.

*Companies.*

Aldershot (not stated).
Alliance and Dublin (47).
Aylesbury (30).
Barking (30).
Bath (50).
Bexhill (33·51).
Bilston (10).
Bish. Stortford (35·95).
Bognor (30).
Bournemouth (37·8).
Brentford (38·5).
Bridgwater (33⅓, aver. 20).
Bridlington (33).
Brighton (42·51).
Bromley and Crays (25).
Bromsgrove (20, meth. hydrogen).
Cardiff (25).
Chigwell (38).
Cleethorpes (20).
Colchester (27).
Commercial (42·25).
Croydon (41·6, av. 29).
Dartford (20, one day only).
Dorking (25).
Durham (20 estimated).
Eastbourne (40).
Epsom (33).
Falmouth (20).
Felixstowe (20·85).
Folkestone (33⅓).
Gaslight and Coke (*).
Gosport (25, av. 2·51).
Gravesend (45, av. 30·8).
Guildford (25 to 33⅓).
Hampton Court (36·2).
Harrow (43 calculated over one week).
Hartlepool (abt. 20, av. 16).
Hastings (37·95†).
Hornsey (33).
Horsham (25).
Hull—British (29).
Hythe and Sandgate (40).
Ilford (19·84).
Ilfracombe (16·7, av. 8·58)
Ipswich (24).
Kingston-on-Thames (25).
Liverpool (50).
Lea Bridge (50, av. 43·7).
Londonderry (15, av. 10).
Maidenhead (34).
Maidstone (20).
Malton (33).
Marlborough (30).
Merthyr Tydfil (30).
Mitcham (35·7).
Newcastle (7·96 one wk.).
Newport, Mon. (23).
North Middlesex (50·58).
Norwich—British (42·8).
Plymouth (41·94).
Portsea Island (30·2).
Prescot (35).
Preston (46·8, av. for one [week).
Ramsbottom (5).
Reading (40).
Redhill (35).
Rhymney (15).
Rochester (36).
Romford (38, av. 29·1).
Rushden and Higham Ferrers (17·03, av. 14·71).
St. Albans (aver. 30).
Scarborough (25·6).
Southampton (35).
Southend (47·06).
Southgate and District (56·7).
South Shields (30·86)
Staines and Egham (25).
Stretford (35·54).
Swansea (25).
Swindon United (39).
Taunton (35).
Tonbridge (25).
Torquay (45·5, av. 27·4).
Tottenham (33¹).
Truro (50).
Tunbridge Wells (25 to 30).
Uxbridge (26).
Waltham Abbey (3·5).
Wandsworth (48, aver. 29).
Watford (31·9).
West Ham (48).
Weston-super-Mare (30).
Wexford (25).
Winchester (30).
Wolverhampton (not stated).
York (30·16).

*Of the total quantity of gas sent out by the Company, 11 per cent. was unmixed with water gas. As regards the remainder, 9 per cent. contained a maximum proportion of 26 per cent. of carburetted water gas; 59 per cent., a maximum proportion of 27 per cent.; 12 per cent., a maximum proportion of 38 per cent.; 9 per cent., a maximum proportion of 40 per cent.; and 11 per cent. a maximum proportion of 41 per cent. † Average for the year, 30·15 per cent.

*Local Authorities.*

Aberdeen (25).
Accrington (25).
Ashford (32·1, av. 15·75).
Barrow-in-Furness (19·34).
Belfast (not stated).
Birkenhead (33·33).
Birmingham (25).
Blackburn (25).
Burnley (40).
Carlisle (32·6).
Chorley (16).
Coventry (34·74 one day).
Devizes (35).
Devonport (52·6).
Dundee (25).
Edinburgh (6).
Halifax (9).
Hebden Bridge (about 20).
Leeds (15).
Leigh (15).
Lincoln (33·33*).
Longton (about 30).
Loughborough (25).
Manchester (18·94 on the total output).
Middlesbrough (no limit).
Nottingham (12·95).
Oldbury (about 20).
Oldham (40†).
Paisley (1·18 oil gas).
Pontypridd (38).
Rochdale (25).
Smethwick (20).
Southport (34·33).
Stafford (36).
Stockport (25).
Stockton-on-Tees (23·7).
Tipton (1).
Todmorden (16).
West Bromwich (28·4).
Wigan (11·78).

* In the daytime; none at night. † At one station, and on one day only.

**Five new Companies appear in this list: Aldershot, Bilston, Bromley and Crays, Felixstowe, and Rhymney and Aber Valleys; and one (Nuneaton) drops out. Among the Local Authorities, Aberdeen appears.**

**The extent to which oil, petroleum spirit, carburine, or "other material" is being utilized for the production of gas will be seen from the following list of the Companies and Local Authorities making returns.**

*Companies.*

Aldershot.
Alliance and Dublin.
Alton.
Aylesbury.
Barking.
Bath.
Bexhill.
Bilston.
Bishop's Stortford.
Bognor.
Boston.
Bournemouth.
Brentford.
Bridgwater.
Bridlington.
Brighton and Hove.
Bristol.
Broadstairs.
Bromley and Crays.
Bromsgrove.
Bude.
Canterbury.
Cardiff.
Chigwell.
Cleethorpes.
Coatbridge.
Colchester.
Commercial.
Croydon.
Dartford.
Derby.
Dorking.
Dover.
Durham.
Eastbourne.
Epsom and Ewell.
Exeter.
Falmouth.
Fareham.
Felixstowe.
Folkestone.
Gaslight and Coke.
Gosport.
Grantham.
Gravesend.
Guildford.
Hampton Court.
Harrow and Stanmore.
Hartlepool.
Hastings.
Hornsey.
Horsham.
Hull (British Co.).
Hythe and Sandgate.
Ilford.
Ilfracombe.
Ipswich.
Isle of Thanet.
Kingston-on-Thames.
Lea Bridge.
Littleborough.
Liverpool.
Londonderry.
Maidenhead.
Maidstone.
Malton.
Marlborough.
Merthyr Tydfil. [don.
Mitcham and Wimble-
Newcastle-upon-Tyne.
Newport (Mon.).
Northfleet.
North Middlesex.
Norwich (British Co.).
Plymouth.
Portsea Island.
Prescot.
Preston.
Ramsbottom.
Reading.
Redhill.
Rhymney & Aber Valleys.
Rochester.
Romford.
St. Albans.
Scarborough.
Shrewsbury.
Southampton.
Southend.
Southgate and District.
South Shields.
Staines and Egham.
Stirling.
Stretford.
Sutton and Hooton.
Swansea.
Swindon.
Taunton.
Tonbridge.
Torquay.
Tottenham.
Truro.
Tunbridge Wells.
Tynemouth.
Uxbridge.
Waltham Abbey and Cheshunt.
Wandsworth and Putney.
Watford.
West Ham.
Weston-super-Mare.
Wexford.
Winchester.
York.

*Local Authorities.*

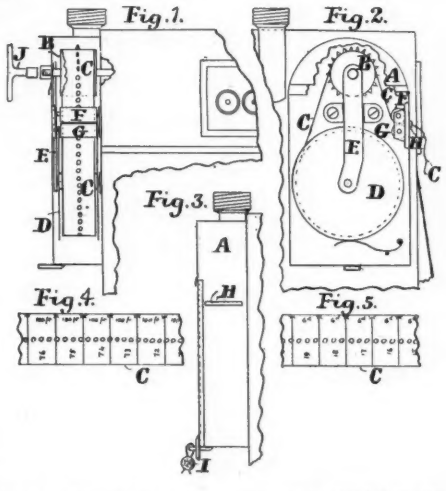
Aberdeen.
Abergavenny.
Accrington.
Airdrie.
Alloa.
Alva.
Arbroath.
Ashford.
Barrow-in-Furness.
Belfast.
Birkenhead.
Birmingham.
Blackburn.
Blackpool.
Burnley.
Carlisle.
Chorley.
Coventry.
Darlington.
Dalton-in-Furness.
Darwen.
Devizes.
Devonport.
Dumfries.
Dundee.
Dunfermline.
Edinburgh and Leith.
Ellon (gas oil only).
Greenock.
Halifax.
Hebden Bridge.
Helensburgh.
Heywood.
Hamilton.
Ilkeston.
Kirkintilloch.
Leeds.
Leek.
Leigh.
Lincoln.
Liverpool (Fazakerley).
Llandudno
Longton.
Loughborough.
Manchester.
Market Harborough.
Middlesbrough.
Middleton.
Mossley.
Nottingham.
Oldbury.
Oldham.
Oswaldtwistle.
Paisley.
Perth.
Pontypridd.
Portsoy (acetylene gas).
Rochdale.
St. Helens.
Smethwick.
Southport.
Stafford.
Stratford-on-Avon.
Stockport.
Stockton-on-Tees.
Tipton.
Todmorden.
Torquay (St. Mary Ch.).
Walsall.
Warrington.
West Bromwich.
Wigan.

**The new names in the above lists are the Aldershot, Bilston, Bromley and Crays, and Felixstowe Gas Companies, and the Aberdeen, Kirkintilloch, and Liverpool Corporations—the last named appearing in respect of their Fazakerley undertaking. The Huyton and Roby, Nuneaton, Quorndon and Mountsorrel, and Richmond Companies, and the Ashburton, Ballinasloe, Bury, and Glastonbury Local Authorities drop out.**

**The Gas Commissioners of Portsoy used 11 tons of carbide of calcium in the manufacture of 99,792 cubic feet of acetylene gas, of which 72,520 cubic feet were employed for private and 24,637 feet for public lighting—together, 97,157 cubic feet, at the price of 5s. per 100 cubic feet. At the date to which the returns were made up (March 31 last), there were 68 consumers, about four miles of mains, and 72 public lamps.**

# CONSUMERS' METERS AND THEIR ACCOUNTS.

THE following communication from Mr. G. J. Cox, the Chief Meter Inspector to the Metropolitan Gas Company of Melbourne, has reference to matters that come within the experience of all who have to deal with details incidental to gas consumers and their accounts. Prior communications from the same source on this subject have been published in our columns; but the devices and methods now proposed to be employed are put forward as a new means of dealing with consumers and the problem of their accounts.




**As shown in figs. 1 and 2, the crown coin-wheel provided in certain makes of coin-freed meters is replaced by a drum or band wheel B, provided with spikes or with sprocket-shaped teeth. A spool D carries a supply of ribbon C, of paper or other fabric.**

The ribbon is pierced along its length with a line of holes, spaced apart to register with the pitch of the teeth carried on the wheel B. The ribbon, as it is used, passes off the spool D, over the drum B (engaging the teeth thereon), under the tension roller F, and out of the chamber A by the aperture H.

In fig. 3, it will be seen that, with the ribbon so arranged, no portion of it can be withdrawn from the chamber A without the drum B is revolved to some extent; and as a meter to which this device is proposed to be applied is presumed to contain all the devices usually pertaining to coin-freed meters, or stop meters (except such portions as would be necessary for holding or dealing with a coin), it follows that the action of revolving the drum-wheel B, by hauling at the ribbon C, will have precisely the same effect upon the valve, &c., as provided within the meter crown for coin-freed purposes, as though the original crown-wheel had been turned through the medium of a coin. It will also be understood that in this arrangement, in order to keep the supply of gas uninterrupted, a ribbon drawing movement is necessarily made from time to time, to re-open the valve as it is automatically brought to the closing point by the meter action.

In one modification of the apparatus, a small portion of the ribbon is simply drawn out by hand as a consumer wishes to provide a continuation of his supply. In the arrangement provided as shown, however, the drum and its shaft is intended to be so braked that the friction set up is greater than the tensile strength of the ribbon; so that a persistent attempt to revolve the drum by pulling at the ribbon would break the ribbon. This provision is made in cases where the exposed end of the ribbon is not otherwise protected from improper interference, and where it is desired to keep the supply under control. In such cases, the drum B can only be revolved by means of a detachable key, such as J in fig. 1. In operating with such a key, it is still intended that a slight tension be put on the ribbon end by the operator's spare hand.

The ribbon C is marked off by transverse lines into divisions of equal length; and each such division represents a commercial unit—say, 100 feet of gas, or the cash value of any unit (say 6d.). It would be preferable to show both the volume and cash value on each unit. It will be obvious that the diameter of the drum B, the length of the ribbon units, and the gearing connections between the drum and the correlative apparatus within the meter must bear consistent relations one to the other. The diagrams originally represented portions of a certain five-light shilling slot meter, the crown coin-wheel of which provides for about 600 cubic feet of gas per revolution. Figs. 4 and 5 are not to the same scale as the other portions.

It will be understood that the limitation regarding the supply made available will be the same as in a coin-action meter, and that only a certain quantity of gas, governed by the range of the valve movement, can be made available for measurement and consumption in the one movement, but that any definite quantity within the maximum can be provided for in the one movement. The consumer operating the apparatus may also have the assistance of the indicator usually provided in slot meters.

As to the usefulness of a meter equipped as described, the first claim made for it is that, for the first time in the history of the gas-meter (so it is believed), means are provided whereby consumers more or less dependent on domestics and others are enabled to determine and allot the maximum amount of gas they desire to be used within a defined period of time, or for a specific purpose, and can set the apparatus accordingly, and leave the meter to complete their arrangements. So far as this goes, it is evident that the use of a prepayment or stop meter would answer the same purpose. But if a customer did not object to prepaying, such meters do not provide what may be considered the central feature of this conception—viz., a cumulative record and easily understood statement of the amount of gas consumed, or in process of consumption, during the usual account-covering period. Something that is capable of keeping a consumer's liability for gas supplied well before his notice would go a long way towards making him quite content when the day of reckoning came.

In connection with an ordinary meter index, there is nothing that obtrudes on a consumer's notice as does the accumulating charge for gas supplied. If a householder discharges his ordinary domestic liabilities monthly, he usually gets a statement concerning them weekly, and is made aware, at short intervals, of his accruing liabilities. But so far as his gas account is concerned, there are few accounts that are paid less gracefully and with less satisfaction, simply because the consumer has had nothing calling his attention in this direction during the whole period covered by the account. By making it necessary for the consumer to go to the meter at intervals, the consumer, without any effort worth considering, takes the record of his liability to date in his hand each time he goes to make provision for maintaining his supply.

The device under notice goes far to solve the problem how to make consumers' accounts for gas supplied to be concurrently determined, on a prearranged date, whereby such accounts would be all for the same length of time, and under similar atmospheric conditions, and provide data that would enable definite comparison to be made between works' output and consumers' meters. The arrangement is workable in two ways; but in either case the co-operation of the consumer is essential, and would probably have to be paid for by a rebate on the account.

(1) The consumers would all have to be coached to take action on a prearranged date to mark the exposed portion of ribbon in connection with their respective meters at the division nearest the aperture. Subsequently, an officer of the supply body inspects the meter, records the index reading then showing on the meter, cuts off the ribbon at the specially marked division, endorses it for office purposes, and returns the detached slip and the present index reading to the office; and if the two records be reasonably consistent, a conventional account for gas supplied, based upon the ribbon record, could issue as a matter of form, as the consumer would, in the prior marking transaction, be fully cognizant of the amount he would be charged in due course.

(2) As a means of enabling a rebate on accounts to be paid for the joint action of recording the consumption and promptly paying the amount due by a consumer, without rendering an account for same, the consumer concerned could be coached to cut off the ribbon ends exposed on a prearranged date, instead of marking them, and present the slips at the supply office and have them accepted as inferential evidence of the amount consumed during an understood period; and provisional receipts could be given for any payments tendered in connection with such slips. As in the prior case, a visit from an inspector, to record the index reading of the meter, is necessary at some time during the account-covering period. Beyond this periodical inspection, however, it will be seen that if it were made attractive so to do, the device provided gives a consumer an interest in dealing with his gas account, and makes it practicable for the supplier to get prompt returns for all the gas sold, with a minimum staff employed. It would also make it an easy matter to substitute monthly accounts for the present quarterly accounts for gas; and although concurrent action on the part of consumers would provide valuable statistical data for comparison purposes, there is nothing dependent otherwise on the concurrent action of consumers.

The arrangement last described, reduced to a weekly system, with a monthly check-reading of the meter indices, would enable coin-meters, and all their vexations to property owners and to both suppliers and consumers, and the cumbersome cash burden, to be dispensed with; the onus of presenting the detached slips, and cash represented thereby, at a convenient receiving depôt, being placed on the consumers, together with such penalties as may be necessary in order to ensure compliance with the scheme agreed upon. The amount of trouble thus thrown on the consumer once a week would be far less than that now placed on him to obtain the necessary supply of coppers, and to operate the meter for each pennyworth he requires. Years ago, the writer advocated, through the "JOURNAL," that weekly accounts for small consumers' supplies would be preferable to prepayment meters. It will be seen, however, that with the system set forth prepayment is not necessarily abandoned, as consumers might be encouraged, by a special discount, to withdraw an amount of ribbon as would probably cover their week's requirements ahead; and thus pay for it in advance.

Provision is made in connection with the ribbon system whereby early intimation would be given to the consumer that the spool is becoming exhausted; and easy access is provided so that a responsible officer can replace the spool when necessary. As a means of more positively identifying the detached slips, apart from hand endorsement, the roller G may be provided, and be engraved for printing purposes with the meter number, and an inking pad be attached—all in such a manner that the meter number would appear at intervals along the back of a slip to be detached from that particular meter.

## THE BIRMINGHAM UNIVERSITY.

### Professor F. W. Burstall's Inventions.

LAST Saturday afternoon, members of the Midland Junior Gas Engineering Association paid their second visit of inspection to the New Birmingham University—their first having taken place in March, 1906, at a time when a portion of the buildings was still incomplete. On this occasion, therefore, there was a good deal to be seen that had not been seen before; and an enjoyable and instructive afternoon was the result. The work of showing the members round was undertaken by Professor F. W. Burstall, who was assisted by Mr. Riley and Mr. F. J. Broscomb; while, when they entered the civil engineering department, they were fortunate in finding there Professor Dixon, the Professor of Civil Engineering at the University.

After an inspection of the Great Hall (which is said to be the largest hall under one roof outside London), the metallurgical department was an object of interest. In the mining department, there is a complete plant for dealing with gold, silver, lead, and tin; and it takes about 100 H.P. to run the whole of this. In the mining rescue room, there is being undertaken work for the Home Office, in the way of experimenting with safety apparatus for rescue purposes. A complete mine on a small scale has been made, and so arranged that it can be filled with poisonous gases; and in this the testing is carried out. There is a well-equipped electrical laboratory, where the students are mainly occupied in making efficiency tests. In the civil engineering department also various machines were seen, and were explained by Professor Dixon. In the smithy, students are instructed in the work of the blacksmith, and also in making small forgings, and such things; and adjoining is a foundry. The students in the general engineering course make their patterns in the pattern-shop, cast the articles in the foundry, and then take them to the machine shop.

The first two years are occupied in a general engineering course; and in the third year they specialize in the civil, mechanical, or electrical branch. All the general repairs about the University are carried out by their own staff; and special apparatus for research work is made by the students, assisted by the staff.

At the power station, which is some distance from the main building, the members, of course, saw much to interest them—the Mond producer gas plant, steam and gas engines of various types, and last, but not least, Professor Burstall's inventions. In the autumn of last year—to be precise, in the number for Sept. 28, pp. 818-820—an illustrated description was given in the "JOURNAL" of Professor Burstall's tar-extracting appliances; and to these he has since added a screen washer, to supplement his rotary tar machine. He explained that when the gas has passed through the centrifugal fan, there is a considerable quantity of suspended water and tar that goes along with it and would ultimately settle in the pipe. But in order to remove this quickly, a sheet of water is provided in the pipe, through which the whole of the gas has to bubble; and this sheet of water abstracts all the suspended water and tar from the gas. Then the Professor's "Static" gas-washer, which was described and illustrated by Mr. W. H. Johns in the paper he read a few weeks ago before the Association (*ante*, p. 495), was seen at work extracting the tar and cooling the gas from the producer plant. One other point may here be mentioned. At the present moment, Professor Burstall is experimenting with an adaptation of the rotary principle which was worked out by the tar-extractor, to the direct recovery of ammonia from the gas. That is to say, the ammonia is taken out while the gas is still hot, and the sulphate formed, without liquors or any means of that kind, by washing with dilute sulphuric acid in a lead-lined chamber, in which rotate a large number of lead-covered wires. The acid falls from the top to the bottom, and the gas rises from the bottom to the top. The resulting liquor is evaporated; and the sulphate is obtained direct. The idea is that the apparatus should be placed in the hydraulic main. Messrs. W. C. Holmes and Co., of Huddersfield, it may be remarked, are the makers of the whole of Professor Burstall's apparatus.

The visit was brought to a close in the handsomely equipped library which has been given to the University by the family of the late Mr. Charles Harding. It was, however, announced that, if, at the termination of the proceedings, any members wished to make a journey to the top of the large tower, Professor Burstall would arrange for them to be taken up by the lift.

The President (Mr. R. S. Ramsden, Burton-on-Trent) proposed a hearty vote of thanks to the Senate of the University, and particularly to Professor Burstall, for having given the party such an interesting afternoon. Certainly, they had seen a great deal that was of special interest to those connected with gas. Unfortunately, he was not one of the party when the Association paid their previous visit to the University, some four-and-a-half years ago; but he understood that there had been a great many additions made since then.

Mr. R. J. Rogers (Birmingham), in seconding the proposition, remarked that it had been a very instructive visit. On the present occasion they had seen a good deal that was new; and if they went there once a year, he thought they would see something fresh every time, because in a University like this there were always changes going on. The thanks of the members were also due to Professor Dixon, for showing them the Engineering Section. To turn for a moment to another matter, most of those present were aware that at the Leeds University and the Manchester University, under the auspices of the Junior Associations in those districts, arrangements had been made for courses of lectures to be delivered by the Professors of the Universities and by other well-known gentlemen on various subjects; and it might not be out of place for them to hope now that something of the same kind might be arranged for the Midland Junior Gas Association in Birmingham. ("Hear, hear.") He did not know exactly what Professor Burstall himself might think of this suggestion; but he could, without hesitation, say that the members would highly appreciate it if Professor Burstall saw his way to give them some promise that he would deliver a lecture (say) on gas-engine efficiencies—because they would always remember him, so far as gas-engines were concerned, in connection with his researches on gas-engine efficiencies. No doubt, the suggestion he had put forward was one that would require careful consideration; but he hoped that if the Association approached the Senate of the University, the proposal would be received favourably.

The vote of thanks having been carried by acclamation,

Professor Burstall said he appreciated it very highly, as he knew other members of the staff would also do. As members of the Association and all Birmingham persons knew, those at the University were only too glad to welcome every section, every class, and every sort of people there. It was a People's University; and it existed for this purpose. He was, of course, specially glad to welcome the members of the Association, because they were connected with an industry in which he himself was particularly interested. If they came there again in another four years' time, he could promise them that they would see a good many more new things, as they had done on the present occasion. With regard to the important question of the University doing something for the gas industry generally, it had been in his mind many times that they ought to do something in this direction; and he thought there was no sort of doubt whatever that, if the Association approached the University authorities, they would endeavour to arrange most probably some course—because one lecture was rather hard on the lecturer, and rather hard on the students—of lectures on the gas industry. He did not think there was any doubt that such a proposal would be received in the most favourable manner.

## BLAND BURNERS FOR CHURCH LIGHTING.

WE have on several occasions referred to the excellence of Bland inverted burners for the lighting of churches; and a photograph which has just reached us of the interior of All Saints' Church, Leighton Buzzard, fully justifies our remarks. It was taken at night, with an exposure of 45 minutes; and all the architectural and other details come out remarkably clearly. The church was

formerly lighted by means of 149 flat-flame burners; but they have been replaced by 50 of the new type of Bland burners, which have proved a great success—every part of the church being beautifully lighted. The Churchwardens say the advantage of the new lighting is greatly enhanced by the reduction effected in the cost of gas; for in the quarter to Michaelmas last there was a saving of more than 68 per cent. compared with the corresponding period of 1909. The actual figures were 16s. 8d., against £2 15s. 3d. The work was carried out by the Leighton Buzzard Gas Company; and the Secretary and Manager (Mr. C. F. Ruggles) states that it has proved so satisfactory that they have received an order to light St. Andrew's Church in a similar way. The Bland Light Syndicate may be heartily congratulated upon the result here recorded.

# REQUIREMENTS OF ILLUMINATION AND THE STATUS OF GAS LIGHTING.

At the Meeting of the Graduates' Association of the Institution of Mechanical Engineers last night, under the presidency of Mr. H. E. JONES, a paper on the above subject was submitted by Mr. JOHN C. BRIGGS, of Workington. We have been furnished by the Secretary (Mr. Edgar Worthington) with an abridgment of the paper, and make the following extracts from it.

The principal object of any lighting engineer in practising the theory of illumination is, of course, to enable the eye to perceive comfortably the objects illuminated. Hence there are two predominant factors—that physiological organ the eye, upon which the effect is produced, and the medium producing the effect. It is necessary, therefore, to eliminate extreme contrasts or objectionably located shadows which tend to produce this effect by a proper distribution of the light sources, and to decrease the shadow contrasts by the adoption of smaller units placed in closer proximity. This will, of course, necessitate an increase in the initial and operating cost of the installation, but a superior distribution of light and greater uniformity of illumination will be attained; and where it is necessary to discern objects at a glance, and rapid movement is general, this is essential. A satisfactory system of illumination should, therefore, possess a complete graduation of light units to meet the exigencies of the various conditions.

Let us now examine the medium producing the effect, and from a few experimental observations it may easily be demonstrated that the intrinsic brilliance of these radiants, or light-reflecting surfaces per square inch of luminous area, exceed by far the natural light to which we are so accustomed. Certainly the antiquated candle and flat-flame burner have intrinsic brilliancies approaching that of daylight; but each further stage of development is marked by a prepondering increase, raising this factor far beyond physiological requirements. Various authorities have therefore advocated a maximum permissible intrinsic brilliance from a hygienic point of view for all light sources. Dr. Stockhausen, in giving 4-candle power, appears to have taken sky brightness as a maximum. Dr. Bell gives 5-candle power; while other authorities have advocated a maximum as low as 0·1 to 0·2 candle power.

It would, however, appear that if all radiants of high intrinsic brilliance are placed at a sufficient distance to prevent side lighting of the eye, and rigorously precluded from the field of vision by being kept invisible from the most frequented or ordinary points of view, and while being high enough to prevent inconvenience or distress are low enough to give a maximum of lighting effect per unit of cost, all danger in this respect would be obviated. When the conditions are unavoidably transgressed, and the source of light protrudes the field of vision, suitable artificial equipment must be employed to reduce the factor to within physiological limits. The application of these mediums results in considerable reduction in physical efficiency of the light source, so that high intrinsic brilliance is not a desirable constituent in an illuminant. The whole question resolves itself into one of relative contrasts of luminous areas of widely different intensities; and it is this fact that makes a source of light which is harmless in broad daylight unendurable at night.

It is evident from the foregoing considerations that sheer intensity of illumination is not wholly responsible for the production of glare, from the fact that glare is exhibited in cases of illumination where the brilliance is less than full daylight. On the contrary, high brilliancy is a source of health, safety, and pleasure, and does not deserve the adverse criticism which has been levied. Defective vision is more the outcome of an ill-regulated supply than a prepondering flood of light. The author has found that a very good effect may be produced, where the ceilings and surrounding walls are light in character, by providing 1-candle power per 2 to 3 square feet of floor area—or, expressed in terms of cubical capacity, 50 candles per 1000 cubic feet—increasing this factor according to the colour of the walls and ceilings, and the degree and nature of obstructions. The amount of light will, however, obviously depend upon the local conditions, the exigencies of work, and the pursuits of the worker. These considerations must alone dictate and prescribe the correct treatment and be solved for each individual case.

## COLOUR.

From the physiological aspect, the author need only refer to the desirability of guarding against a short wave and invisible ultra-violet rays which produce such a deleterious effect upon the faculty of vision by inflaming the anterior structure and injuring the human lens. The wearisome effect produced by artificial lights has been also ascribed by various authorities to the presence and the tendency towards increasing this undesirable constituent in the spectra of the various illuminants. Fortunately, however, the glass accessories or enclosing mediums have the effect of absorbing a portion of these; thus considerably minimizing the danger from this source. When the daylight balance of colours is not maintained, the light ceases to be white; the excess or absence of some particular colour being noticeable in the resultant colour effect. It might be asserted that the efficiency of the source of light is dependent to a great extent upon its colour. In practical illumination, it is impossible to dissociate it from the colour of the ceilings and the surrounding walls, the influence of which must also be considered as an important feature in this respect.

## GLASSWARE.

The author has dealt with the intrinsic brilliance of the illuminant. He will now examine the medium employed to balance the physiological factor, and the methods in vogue for securing extraneously a superior distribution of light. Such equipment may be divided into three general classes—globes, shades, and reflectors. The usual object in employing globes or shades is, in the first place, to effect a greater diffusion of light, and to protect the eyes by decreasing the intrinsic brilliance of the illuminant. The disadvantage to their adoption, however, lies in the fact that they offer a certain amount of obstruction to the passage of light; the proportion of the light obstructed varying according to the shape and the character of the material composing it. Thus Mr. William King found that, when using a No. 3 fishtail burner, the various descriptions of globes mentioned below obstructed the passage of light in the following proportions:—

| | Percentage Loss of Light. |
|---|---|
| Clear-glass globe | 10·57 |
| Ground-glass globe | 29·48 |
| Smooth opal | 52·83 |
| Ground opal | 55·85 |
| Ground opal with painted figures | 73·98 |

This clearly amplifies the necessity, while fulfilling the desired object, of preventing waste by using globes or shades restricting the least possible percentage of light. It also explains the great loss in physical efficiency where dense globes have to be utilized in order to reduce brilliant high-power light resources to within physiological limits previously referred to. Reflectors, as their name implies, change the distribution of light by dissipating those rays which would otherwise be wasted into the area to be illuminated.

## VENTILATION.

The interference with the hygienic conditions of workshops and factories through contamination of the air supply for human functions would be disastrous to the adoption of any particular illuminant. A few moments' deliberation might be helpful in an attempt to solve the prejudices attributable to different systems. In order to form a clear conception of the subject, the various systems may be divided into two general classes—those which evolve light with the production of heat, and those which also produce heat with the evolution of carbonic acid and sulphur compounds, and depend upon the surrounding atmosphere for the supply of oxygen for combustion. In selecting gas and electric light for consideration, not only are the more general methods opened for discussion, but the chief representative of each class chosen.

Gas lighting, in the first place, is accredited by electrical engineers with the production of stuffy and uncomfortable rooms, with the accompaniment of headaches, lassitude, and ill-health generally, not to consider the devouring of the oxygen from the atmosphere. On the other hand comes the ready response reciting gas as a boon, by the injector action of its ventilating properties, revivifying the atmosphere by a continuous gentle current of uncontaminated air, and preventing those objectionable downdraughts characteristic of a system of electric light, due to the descending currents of human respiration being cooled through contact with the ceilings, windows, and walls, being displaced by the heated upward current, accelerated by the specific gravity of the cooled carbonic acid.

Observations go to show that carbonic acid has not the harmful effect attributed to it, but that it is the bad company in which it finds itself in the form of poisonous organic substances from the exhalations of the human organism. These to a certain extent become incinerated by the action of the gas-flame and sterilized by the sulphur compounds. If the function of a gaslight installation is properly understood and correctly applied, it may also be utilized to serve the useful purpose of assisting defective natural ventilation by removing the vitiated air and establishing efficient ventilation.

## DANGERS.

With the development of the various systems of lighting, the attitude of the fire insurance officials may well be studied as a fair criterion of the dangers and hazards to which property and life are submitted by the use of gas and electricity respectively. With the birth of electric light, many suggestions were forthcoming in order to obtain certain concessions and privileges over users of gaslight; but the extended experience of the offices has only resulted in the depleting of certain original restrictions in favour of gaslight, and placing the systems under equal obligations. The advent of the high-pressure system of gas lighting may also have raised doubts in the minds of some people; but, after strict inquiries, the insurance officials have found no additional risk to necessitate the differentiating of premiums. Certainly, in exceptional cases of extreme danger—such as trades where celluloid is used, or where fine inflammable dust is present in large quantities—the companies prefer electric light; but it is necessary to employ only the enclosed types. Cases are indeed isolated where accidents occur through defective gas installations or the deterioration of the system. They are due rather to stupidity, forgetfulness of simple rules, and disobedience.

### High-Pressure Gas Lighting.

The high scientific knowledge and technical skill expended in the development of gas and electric light are worthy of the fullest admiration; and the evolution of the high-pressure inverted gas-burner and the electric metallic filament lamp commands the highest appreciation. The incandescent burner is in reality a heat-light engine of rather low efficiency, approximating that of the ordinary slide-valve steam-engine; and therefore the energy delivered as light must bear some relationship to the energy put into it as heat per unit of time. This transformation of energy, which is shown in the following table by Professor Lewes, indicates the enormous proportion still dissipated and lost in the form of heat.

| *Coal Gas.* | Heat. | Light. | *Electric Light.* | Heat. | Light. |
|---|---|---|---|---|---|
| Flat-flame and argand | 98 | 2 | Geissler tube | 97 | 3 |
| Regenerative | 93 | 6 | Arc | 90 | 10 |
| Incandescent | 88 | 12 | Incandescent | 95 | 5 |

The bunsen burner, in one or other of its modifications, is the one adopted in incandescent gas-light. The imperfections of the earlier forms of burners were manifest in the incomplete mixtures of gas and air attainable, with consequent low flame temperatures; and as light-emitting power is synonymous with high-flame temperatures, low efficiencies only were obtainable. The protracted consideration of this question, however, has evolved burners capable of attaining remarkable efficiencies; 30-candle power per cubic foot being comfortably attained under the low-pressure system, while the use of higher pressures has added a new impetus to the industry by still further raising this factor to between 60 and 70 candle power per cubic foot.

The improvements wrought in mantle production have in no small measure contributed to the high efficiencies and reduced maintenance costs now prevailing in gas lighting. The web base of the mantle is in reality a structure of thoria and ceria in the proportions of 99 per cent. of the former and 1 per cent. of the latter. Thoria is an extremely bad radiator of heat, and therefore capable of attaining a very high temperature. It, however, possesses only poor light-emitting properties; but with the aid of the "excitant," the mass is raised to a high state of incandescence, producing a beautiful white light.

The question of distance lighting has always been considered a great deficiency in the system of gas lighting; but the numerous descriptions of appliances now available for this purpose have entirely removed this objection. Where the use of a bye-pass is also considered a disadvantage, electric ignition can be substituted, where a momentary current operates an electrical control-valve on each lamp, and simultaneously ignites the gas.

The author gave a table showing the cost of 1000 candles for one hour with gas and electric current.

## ASSOCIATION OF WATER ENGINEERS.

The Winter Meeting of the Association was held last Friday and Saturday at the Rooms of the Geological Society, Burlington House, W.—the President (Mr. W. H. Humphreys, of York) in the chair.

The Secretary (Mr. Percy Griffith) read the minutes of the annual meeting held at York on June 2 and 3 last; and they were confirmed.

### Papers and Discussions.

During the two sittings, the papers considered were as follows:

"The Wellingborough Water-Works and Softening Plant," by E. Young Harrison, Assoc.M.Inst.C.E., of Wellingborough.

"Gauging and Recording the Flow of Streams," by S. C. Chapman, Assoc.M.Inst.C.E., of Torquay.

"The Eliminating Effect of Chlorine on the Bacteria of a River Water," by Leslie C. Walker, of Reading.

"The Advantages of Co-operation in Rural Water Supplies," by F. Graham Fairbank, M.Inst.C.E., of York.

Extracts from the papers and indications of the points of the discussion will be published in future issues of the "Journal."

### Water Supplies Protection Bill.

Mr. Easton Devonshire (London), the Chairman of the Water Areas and Statistics Committee of the Association, presented reports (from which the following extracts are given) on the question of the Water Supplies Protection Bill, 1910, and the Government action arising thereon.

In the interval since our last report relative to the above Bill, the Joint Select Committee have issued a report upon the Bill, which is of such importance that your Committee have reproduced it as an appendix to this report.* It will be seen that the Joint Select Committee indicate their opinion that the provisions of the Bill do not adequately meet the circumstances or overcome the difficulties to which their attention was drawn by the various witnesses, nor even those which the promoters of the Bill presumably had in mind when drafting the clauses thereof.

Having dealt with the more important provisions of the Bill, the Joint Committee draw attention to the larger question raised by the evidence, and, after commenting on the absence of trustworthy information as to the water supply available in any particular district, and as to the effect of rainfall on the water-levels in various parts of the country, state that:

> They consider that a remedy for this state of things is urgently called for; and they think that it may be found by creating an organization empowered to inquire into the whole question of surface and underground water supplies from a comprehensive standpoint; to supervise the future allocation of supplies; and to serve as an authoritative adviser to Parliament in the consideration of particular schemes.

In the concluding paragraph of their report, the Joint Committee strongly recommend:

> (1) The establishment (within the Local Government Board, or independently, as may seem best to the Government) of such a Central Administrative Authority as is contemplated in paragraph 356 of the fifth Report of the Royal Commission on Sewage Disposal. And (2) the division of the country into watershed areas, and the appointment for those areas of local Representative Boards, who, subject to the guidance and control of the Central Authority, should prosecute systematic and continuous inquiries into the water supply of their jurisdiction; take all measures to husband such supplies, both surface and subsoil; secure their preservation from pollution; and advise on their allocation for sanitary, industrial, and other purposes.

The above recommendations so nearly accord with those which have been made by our Association from time to time during the last ten years, that we feel perfectly justified in claiming that the Joint Committee in drafting their report were materially influenced by the evidence put before them on behalf of our Association.

[The report of the Association Committee then proceeds to state the steps taken by them to bring before the Joint Committee the views of the Association on points raised by the Bill.]

Your Committee ask for the Council's sanction to the steps they have taken, and suggest, in regard to the expenditure incurred, that the various water authorities whose views on the Bill were represented by the Association should be invited to contribute towards such expenditure on some reasonable scale.

Your Committee ask the authority of the Council to take such further action as may from time to time seem desirable to give effect to the recommendations of the Joint Committee, and to further the views of the Association.

In the course of a further report, the Committee remarked:

Since the presentation of our last report, further action has been taken by Parliament in connection with this matter. On July 27, Mr. J. G. Butcher asked the Prime Minister the following question in the House of Commons:

> Whether, in view of the grave difficulties arising in connection with the abstraction of underground water by water authorities and others, and of the demand for an alteration in the law as regards compensation for injury caused by such abstraction, he will favourably consider the recommendation of the Select Committee to the effect that a comprehensive inquiry into the whole subject of surface and underground water supplies should be held.

To this question, the Prime Minister replied:

> I understand that, prior to the appointment of the Joint Select Committee, my Right Hon. friend, the President of the Local Government Board, had decided to introduce a Bill to give effect to the recommendations of the Royal Commission on Sewage Disposal, endorsed recently by the Joint Select Committee. The recommendations of the Select Committee will be carefully considered by the Government in connection with the Bill in question.

On Nov. 24, on the motion of Mr. Herbert Lewis, Parliamentary Secretary of the Local Government Board, the House of Commons made the following Order for a return:

> Showing, as regards every water undertaking in England and Wales—
> (*a*) The powers, if any, under which the undertakers are authorized to supply water.
> (*b*) The limits within which the undertakers are authorized to supply water.
> (*c*) The places actually supplied.
> (*d*) The sources of supply, their nature, and sufficiency.
> (*e*) Particulars as to the works, the quantity and quality of the water supplied.
>
> And also as regards every district in England and Wales—
> (*a*) The area and population of the district, and the number of houses therein.
> (*b*) The number of houses supplied with water from a piped service.
> (*c*) The names of the undertakers providing a supply of water.
> (*d*) The source, nature, and sufficiency of the supply where there is no piped service.

As regards the Order made by the House of Commons for an inquiry into the facts as to the water supplies of England and Wales, their distribution and sufficiency, this is, in principle, in accord with the recommendations made by this Committee as long ago as Nov. 5, 1900, which recommendations were endorsed by evidence put forward by the Association and other witnesses in opposition to Lord Desborough's Bill. In the absence of knowledge as to the form of the questions which may have to be answered as a result of this Order, it is impossible to offer any detailed criticism; but your Committee are of opinion that the Association should express satisfaction that the preliminary step taken accords in principle with the recommendations advanced by the Association from time to time.

The question of the consolidation of existing water-works legislation was not touched upon in the report of the Joint Committee on Lord Desborough's Bill; and your Committee think that, in view of the expressed intention of the Government to introduce a Bill, the Association should take the initiative in formulating in outline suggestions on the various points in water legislation requiring amendment or consolidation with the view of creating uniformity in practice.

To give practical effect to the recommendations of the Committee, Mr. Devonshire moved:

(1) That the Association of Water-Works Engineers note with satisfaction the passing by the House of Commons of an order for a return to be made by the Local Government Board of statistics as to the powers, limits, nature, source, and sufficiency of supply of authorized water undertakings, as well as particulars as to the population, number

* The report was published in the "Journal" for July 26, p. 280.

of houses, source, and sufficiency of supply, whether piped or not, in every district in England and Wales; an inquiry to this end being in accord with the recommendations made by the Association.

(2) That in view of the probable introduction of a Bill dealing with matters affecting the national water supply, the Council be requested to take steps to protect the interests of water undertakings so as to secure the amendment, consolidation, and uniformity of legislation.

Mr. W. MATTHEWS, in seconding, said he thought the time had arrived when the Association should pass such resolutions, because they would strengthen the position of the Committee who had been acting in this matter, and that of the Council who had adopted their reports. The Bill was sprung upon the Association suddenly; and its provisions appeared at once so absolutely dangerous to every water authority and undertaking in the country, that very prompt action had to be taken. The Committee did their best under the circumstances; and he hoped that what was done would meet with the general approval of those interested in the matter. He thought the Association might congratulate themselves that, in the opposition to the Bill, they appeared in the very forefront; and that their position and their status were thoroughly well recognized by everybody engaged in the inquiry. The Committee were anxious the Association should not be allowed to go back from this position, but that they should maintain it, as it had undoubtedly acquired for them an influence for good in the future. They thought that, in the interests of everybody concerned, they should take steps now to be (what he might term) just a little bit in front of the Government Bill. The Committee had every reason to think that, if they put suggestions before the Local Government Board, they were likely to get a very patient and proper hearing, and that the Board would welcome any suggestions from them.

Mr. E. J. SILCOCK (Leeds) congratulated the Committee upon the results of their labours, as indicated by the decisions to which the Parliamentary Committee had arrived. With regard to the resolutions before the meeting, no doubt the members would be involved in considerable trouble in getting out all the particulars required; but they would have the satisfaction of knowing they would be preparing statistics which would form the foundation of very useful work that would be of national value.

Mr. F. W. HODSON (Loughborough) agreed with the suggestion that the Council should ask the authorities who had benefited by the work of the Committee to assist in the payment of the expenses which had been, and would be, necessarily incurred in adequately dealing with this matter. It was a good idea, as many of the smaller authorities could not possibly individually oppose or promote any suggestions which might be brought before Parliament.

Mr. E. ANTONY LEES (Birmingham) said he took it, in view of the return that would have to be made to the Local Government Board, that the independent collection of statistics by the Association would be suspended for a time. Probably the returns that would have to be made to the Board would be available to the Association, and would supply the information they had sought to obtain. It had occurred to him that it would be a great pity to have the work duplicated.

Mr. R. ASKWITH (Weardale and Consett Water Company) did not agree with Mr. Lees. He thought the Association had better enter into the matter at once, and obtain information which would help to lead the Local Government Board, so as to keep things in the right course.

Mr. A. B. E. BLACKBURN (Sunderland) supported the action of the Council. He heard the evidence of both Mr. Matthews and Mr. Percy Griffith before the Committee; and he was fortunate enough to be called as a witness himself against the Bill. Therefore, he knew what had actually taken place. The members were to be heartily congratulated on the position the Association had taken in regard to the matter.

The resolutions of Mr. Devonshire were unanimously carried.

Mr. E. Y. HARRISON (Wellingborough) proposed a resolution recording the thanks of the members to the Committee for the way in which they had dealt with the matter.

Mr. J. F. CULLEN (Deal) seconded the motion.

The PRESIDENT observed that he had been anticipated. It had been his intention to express to Mr. Devonshire, Mr. Matthews, Mr. Bancroft, and the Secretary their appreciation of their services, because he knew what an immense amount of work they had done in connection with the Bill. Mr. Whitaker had also rendered a large amount of assistance.

The motion was heartily passed.

Mr. DEVONSHIRE, in reply, remarked that it was satisfactory to the Committee to know they had been able to earn the thanks of the members. The work had been hard; and they had had a great deal of information to assimilate to help them in preparing the evidence to lay before the Joint Select Committee. He did not like the suggestion made by Mr. Lees. If the Committee were to forestall any action which might be taken by the Government, they ought to know in advance the information the water authorities had been supplying to the Local Government Board.

Mr. LEES repudiated any desire to keep information from the Committee. But it seemed to him if the Committee were furnished with the details sent to the Local Government Board, that would suffice, and would save double work.

Mr. PERCY GRIFFITH remarked that the particulars furnished to the Association would probably prove to be additional to what would be asked for by the Local Government Board. The Committee had said in their report that they did not know the nature of the questions which would be sent out to the water authorities; and until they knew it, they could not say what more should be given to the Association. It would be a pity if the members considered the order of the House of Commons should in any way take the place of the returns asked for by the Association. At the present time, they were acquiring a valuable accumulation of maps at the office which would be of great service. The information would be valuable for reference, and no doubt for use in connection with any movement that might be made to protect the interests of water authorities.

### ELECTION OF OFFICE-BEARERS.

The Scrutineers (Messrs. J. C. Hawkins and W. Shaw) reported the following elections to office:

*President:* Mr. Edward Sandeman (Derwent Valley).

*Vice-Presidents:* Mr. Joseph Spiers Pickering (Cheltenham), and Mr. Charles Clemesha Smith (Wakefield).

*Ordinary Members of Council:* Messrs. Easton Devonshire (London), G. Greenslade (South Hants), F. Griffith (Leicester), H. Ashton Hill (South Staffordshire), W. Matthews (Westminster), F. W. M'Cullough (Belfast), T. Molyneux (Stockport), R. H. Wyrill (Swansea), C. H. Priestley (Cardiff), and A. B. E. Blackburn (Sunderland).

*Honorary Secretary and Treasurer:* Mr. W. G. Peirce (Richmond).

### PLACE AND DATE OF NEXT MEETING.

Mr. SANDEMAN, having thanked the members for the honour done him, said that he had been considering the question of the meeting next summer; and he suggested that Buxton would be a suitable place. The Buxton District Council had offered the use of the Town Hall; and his Water Board extended a cordial invitation to the Association to visit their works. The dates suggested for the meeting were May 25, 26, and 27. This was rather earlier than usual, as, if the meeting was held the first week in June, it would clash with the Whitsun holidays.

### NEW MEMBERS.

The roll of membership was extended by the following names:

*Members.*—Mr. T. Booth, of Stamford; Mr. G. G. Bullmore, of Newquay; Mr. A. E. Cornewall-Walker, of Redhill, Surrey; and Mr. Walter Hunter, of Westminster.

*Associate Members.*—Mr. C. Boldry, of Chesterfield; Mr. P. N. Buchan, of Plymouth; Mr. H. Cottam, of Grizedale Lea Reservoir (Fylde Water Board); Mr. W. Criswell, of Eccles, Manchester; Mr. C. G. Kent, of Rochester; Mr. A. Murray-Smith, of Cheltenham; and Mr. G. K. Sutherland, of Cardiff.

*Associates.*—Mr. T. C. Pulman, of London; and Mr. W. P. Walker, of London.

Mr. T. Waddingham was transferred from the class of associate members to that of members.

### INCORPORATION.

The PRESIDENT remarked that, at the summer meeting, he mentioned that the matter of the incorporation of the Association was in hand. The question had taken the Council more time and anxious consideration than they had anticipated; and it was still under discussion. They were giving careful attention to all proposals in connection with it. With one or two more meetings of the Council, however, they might be able to get the matter ready for the next summer meeting.

### VOTES OF THANKS.

Votes of thanks were passed to the President and Council of the Geological Society for the use of their rooms for the meeting, to the authors of the papers, and to the Scrutineers.

This concluded the business before the meeting.

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**Glover-West Vertical Retorts for Bradford.**—The Bradford City Council will have before them at their meeting to-day a recommendation by the Gas Committee to sanction the acceptance of the tender of West's Gas Improvement Company, Limited, for the erection of 64 Glover-West vertical retorts at the Thornton Road works. This will be a 2 million cubic feet per day plant, and the largest installation of vertical retorts ordered so far for this country.

**Reduction in Price by the Gaslight and Coke Company.**—It was mentioned in the "JOURNAL" for the 22nd ult. that at the meeting of the Directors of the Gaslight and Coke Company the previous Friday it was decided to reduce the price of gas 1d. per 1000 cubic feet as from the taking of the meter indices for the current quarter. The decision has now been announced in most of the newspapers. This is the fourth year in succession that a reduction has been made; and the latest will bring the figure down to 2s. 7d. per 1000 cubic feet.

**Physical Society's Annual Exhibition.**—The sixth annual exhibition of scientific apparatus will be held by the Physical Society of London on Tuesday next, at the Imperial College of Science, South Kensington. It will be open, as last year, in the afternoon from three till six, and in the evening from seven till ten. Among the firms who will exhibit, those in which readers of the "JOURNAL" are interested are the Cambridge Scientific Instrument Company, Messrs. J. J. Griffin and Sons, Messrs. Townson and Mercer, and Messrs. Alexander Wright and Co.

# THE TEN MILLION CUBIC FEET GASHOLDER AT MANCHESTER.

By FRANK H. ROBINSON, Assoc.M.Inst.C.E.

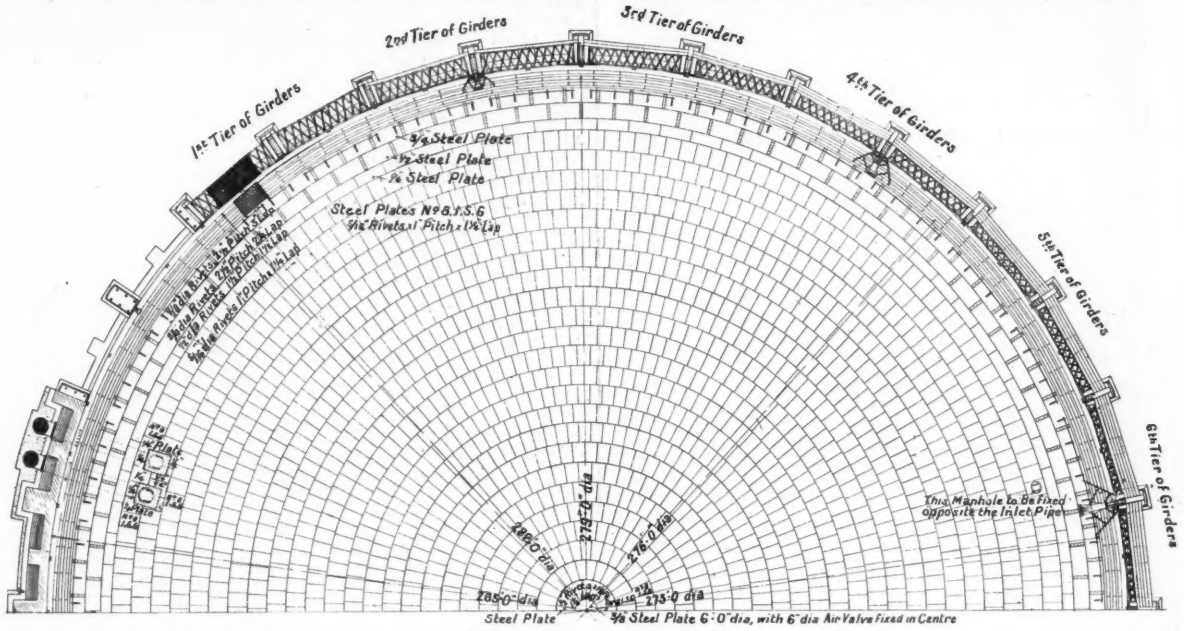
**[A Paper read before the Manchester Association of Students of the Institution of Civil Engineers.]**

This paper completes the description of the large structure now being erected at the Bradford Road Gas-Works, Manchester. The brick and puddle tank with its steel framing and inlet and outlet pipes was fully dealt with on the 24th of November last year, in a paper read by the author before the Association.* For the benefit of those who were not present on that occasion, he gave the following particulars.

The tank is 285 feet diameter and 43 feet deep to the top of the rest-stones from the coping. It is built in brick, set in cement mortar with a clay puddle backing; and the foundations and covering of the cone are in 5 to 1 portland cement concrete. The steel framing in the tank weighs 258 tons. The water required to fill the tank was 9,042,018 gallons. The inlet and outlet pipes are 42 inches inside diameter. The gasholder is a four-lift one. The outer lift is 282 feet diameter, the third lift 279 feet diameter, and the second lift 276 feet diameter—all these lifts being 42 ft. 6 in. deep. The inner lift is 273 feet in diameter and 43 feet deep, with its crown having a rise of 20 feet in the centre, forming a segment of a sphere with a radius of 476 feet. The guide-framing will extend the whole height of the holder when inflated, and consists of 32 lattice steel standards connected together by six tiers of horizontal lattice girders, and braced together diagonally. The total capacity of the holder when fully extended is 10,410,000 cubic feet. The height to the top of the crown will then be 182 feet; the standards reaching a height of 169 ft. 6 in. from the ground level. The floating weight of the holder itself is 1607 tons; and the total weight of steel and iron in the holder complete, but excluding the tank framing, is 3080 tons. The estimated cost of £52,600 includes the whole of the iron and steel work in the tank and holder complete.

The author then gave the following detailed description of the structure, and incidentally dealt with features which govern the design of gasholders.

The gasholder itself consists of a cylindrical vessel, in four sections, which rests in the tank of water like a closed telescope when the holder is empty, and appears like a huge extended telescope when fully inflated. Each lift slides in and out of the next larger lift as the holder falls and rises in exactly the same manner as tubes of an ordinary telescope. The water in the tank serves a threefold purpose: (1) To prevent the escape of gas from the holder; (2) to provide resistance to the gas as the holder rises; and (3) to expel the gas from the holder as the latter falls.


1st Tier of Girders
2nd Tier of Girders
3rd Tier of Girders
4th Tier of Girders
5th Tier of Girders
6th Tier of Girders
⅜ Steel Plate
½ Steel Plate
⅝ Steel Plate
Steel Plates N°8.T.S.6
⅝" Rivets at 1" Pitch x 1⅛" Lap
This Manhole to be Fixed opposite the Inlet Pipe
285'0" dia
280'0" dia
279'0" dia
276'0" dia
275'0" dia
Steel Plate
⅜ Steel Plate 6'-0" dia, with 6" dia Air Valve Fixed in Centre

[Rise of Crown at Centre, 20 feet.]

**Half-Plan of the New Holder at the Bradford Road (Manchester) Gas-Works.**

In this holder there are four lifts or sections. The first or inner lift will now be described, followed by the others, and then the guide-framing.

### INNER LIFT.

The top curb is formed of an outer row of steel crown plates ¾-inch thick, a second row of plates ½-inch thick, a ring of ¾-inch steel plates 16 inches wide, fixed at right angles to the crown underneath, and attached thereto by 4 inch by 4 inch by ¾ inch steel angles. In addition to the above, the top row of side plates, 3 feet deep and ⅜ inch thick, together with a ring of 6 inch by 6 inch by ⅞-inch splayed steel angle uniting these plates to the crown, complete the curb; the total sectional area being 115 square inches. All these curb plates are butt-jointed with planed joints, so that the whole cross area of the curb shall be effective. The crown plates are all correctly radiated, and cut to the proper curves. All the joints are covered with cover-plates ⅛ inch thicker than the plates the joints of which they cover, and are secured with zigzag riveting. This curb is subjected to great compound stress, and must therefore be very rigid, so that no distortion may take place in a high wind when the holder is fully inflated.

The forces acting on the curb are as follows: (1) The pull of the top sheets caused by the pressure of the gas on the under side of the crown. (2) The wind pressure acting horizontally on the side sheets and transmitted to the curb. (3) The weight of the side sheets, outer lifts, &c., acting in a downward direction. (4) The pressure of gas on the side sheets from within acting in a horizontal direction.

The resultant of these forces is found to cause compression in the curb. The curbwould therefore fail by buckling or else by compression. In this holder, the stress works out at 6 tons per square inch on the curb, which is a safe working stress. As there is always a certain tendency for a gasholder curb to buckle, it is as well to keep the stress low. Further, extra strength here relieves the guide-framing of a good deal of stress, and reduces very considerably any tendency in the latter to distort.

In connection with gasholders, Mr. F. Southwell Cripps, Assoc. M.Inst.C.E., has gone very fully into all the stresses and their solutions, and has deduced many formulæ for arriving at these stresses; one of these being used in the case given above. Too much time would be taken up if the author were to submit and explain all these formulæ, besides serving no useful purpose. There are 100 pages of diagrams and printed matter in Mr. Cripps's book on "The Guide Framing of Gasholders, &c.," in which only stresses are dealt with. It would be obviously too much for any audience to sit and listen to a recital of such an amount of theoretical matter, however interesting it might be. The author will therefore only point out the principal features of gasholder design.

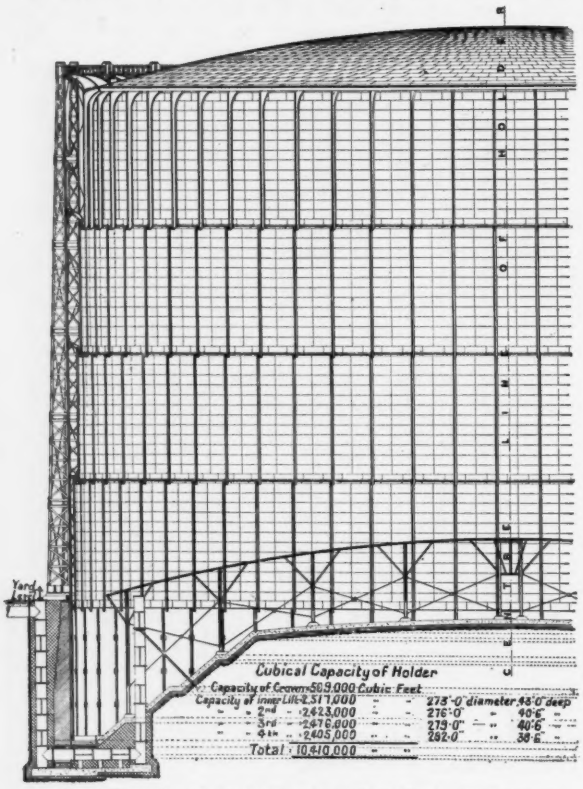
The hydraulic cup is on Piggott's system, 21½ inches deep, 11½ inches wide inside, and made of ½-inch plate bent to the correct shape. On the inside edge of this cup, a stiffening bead of 3 inch by ¾ inch steel is riveted.

The "cup and grip" together form the water seal between the lifts, to prevent any escape of gas; the water being contained in the cup, which must be sufficiently deep to prevent any escape of gas when at maximum pressure.

* See "JOURNAL," Vol. CVIII., p. 609. Reference may also be made to the paper containing particulars of the tank prepared by Mr. J. G. Newbigging for the Manchester District Institution of Gas Engineers—given in the "JOURNAL" for March 2, 1909 (p. 618); and to the account of the inspection of the tank and holder by members of the City Council, contained in the issue for Sept. 27 last (p. 838).

The side sheets of the lift vary in thickness according to position. As previously mentioned, the top row forming part of the curb is $\frac{5}{8}$-inch thick. The following row, and also the next to the cup are $\frac{1}{2}$-inch thick. The remaining intermediate rows of sheeting are of No. 9 imperial standard gauge thickness of steel, riveted with $\frac{11}{16}$-inch rivets, 1-inch pitch, and $1\frac{1}{4}$-inch laps. Opposite to each vertical stay, and riveted to it, is a vertical strip of $\frac{1}{2}$-inch plate, 18 inches wide, extending from the $\frac{5}{8}$-inch curb plates to the $\frac{1}{2}$-inch cup plates, in two lengths, and butt-jointed at the centre. The side sheets are riveted to these vertical strips with $\frac{5}{8}$-inch rivets, 2-inch pitch. For the purpose of stiffening the lift, there are 64 vertical stays, placed opposite to, and intermediate between, the standards. They consist of upright plate girders, 18 inches deep by $6\frac{3}{8}$ inches wide, with shaped ends. Additional horizontal stays are fixed between the feet of the stays, and are left straight—not being bent to the curve of the holder.

As already mentioned, the two outer rows of crown plates at the curb are thicker than the others, as the principal stress comes on the curb. The next row—*i.e.*, the third—is $\frac{1}{2}$-inch thick. The centre plate is 6 feet in diameter by $\frac{3}{8}$-inch thick; the row next to this being $\frac{1}{4}$-inch thick. All the intermediate rows are then of No. 8 imperial standard gauge thickness of steel. The whole of the sheets are correctly radiated and cut to the required curves on the circumferential edges. Two manholes are provided in the holder crown—one over the inlet pipe, the other over the outlet pipe. They are of the Livesey type, and enable the pipes to be inspected without blowing out the gas from the crown of the holder when down on the rest-stones, a water seal being provided. There is also an ordinary manhole fixed to the crown on the opposite side to the inlet and outlet pipes, for access to the interior of the holder.


Cubical Capacity of Holder
Capacity of Crown=809,000 Cubic Feet
Capacity of inner Lift=2,317,000 " " 273'-0" diameter 45'-0" deep
" " 2nd " =2423,000 " " 276'-0" " 40'-6" "
" " 3rd " =2476,000 " " 279'-0" " 40'-6" "
" " 4th " =2405,000 " " 282'-0" " 36'-6" "
Total 10,410,000 " "

**Sectional Elevation of the Standards, Holder, Tank, and Framing.**

An air-valve, 6-inch bore, is provided in the centre crown plate for discharging the contents of the holder crown. Round the curb of this inner lift there is a hand-rail, composed of three tiers of $1\frac{1}{4}$-inch gas-tubing. Two landings are fixed to the lift. They consist of chequered plates hinged to the holder curb; the outer or free end being suspended by chains from the hand-railing. These landings are fixed near the ladders in the guide-framing, so that men may be able to get on to the crown of the holder whatever its position may be.

The top guide-carriages are each provided with three cast-iron rollers—one radial and two tangential. The radial rollers are 24 inch diameter, with $2\frac{1}{4}$-inches diameter steel axles, provided with forks and adjusting screws, so that the face of the rollers may be brought up to the guides or otherwise; slotted holes being provided in the sides of the carriages for this purpose. The tangential rollers are 18 inches diameter, mounted on $1\frac{3}{4}$-inch steel axles, and roll up and down the flanges of the H-steel guides. The carriages themselves are formed of steel plates and angles with additional steel angle wing stays from the rollers to the crown to counteract any side play. All rollers have turned rims, with bosses turned, faced, and bushed with $\frac{5}{8}$-inch thick steel bushes. The total number of these carriages is 32—*i.e.*, one opposite each standard; and each weighs, without rollers, 26 cwt.

Attached to the cup at the bottom of the lift are 64 carriages and rollers; the carriages being formed of steel plates and angles. The rollers are 12 inches diameter; and they roll up and down the guides on the inside of the second lift. The axle holes are, as in the larger carriages above, slotted to allow for an adjustment being made. Steel wedges are also inserted behind the carriages to prevent any slipping back when once they have been adjusted. The ends and nuts of all the axles are drilled and then fitted with split pins.

The total weight of the lift is 672 tons, which will give a pressure of 4·9 inches of water when stationary. The friction of the rollers, snow, and wind, will, in a slight degree, add to, or take away from, the pressure given above as the lift rises or falls.

### Second Lift.

We now come to the second lift, which is 3 feet greater in diameter and 6 inches less in depth than the first or inner lift. The cup and grip of this lift are exactly the same as the cup for the inner lift; the grip being provided with a number of cast-steel rest blocks, to receive the weight of the other lifts when the holder is extended. These blocks prevent any wearing on the plate. On the inside of the sheeting, and secured thereto by $\frac{3}{4}$-inch rivets, 6-inch pitch, are 64 guides, formed of $3\frac{3}{4}$ in. by $2\frac{1}{2}$ in. by $\frac{1}{2}$ in. bulb angles in pairs, up and down which the rollers of the bottom carriages on the inner lift travel. These guides also stiffen the sheets. They are attached to vertical strips of $\frac{1}{2}$-inch plate similar to those for the inner lift. On the outside of these plates, and back to back with the inner bulb angle guides, are similar pairs of bulb angles running vertically from cup to grip, riveted through to the guides inside; these also acting as stiffeners. The rows of side sheets next to the cup and grip are $\frac{1}{4}$-inch thick and 2 ft. 11 in. deep, centre to centre of rivets; all the intermediate rows being No. 9 imperial standard gauge, and 3 ft. 2 in. deep, centre to centre of rivets.

The grip carriages are similar to those on the first lift, but smaller. The radial and tangential rollers are 18 inches and 15 inches diameter respectively. The cup carriages and rollers are exactly like those on the inner lift, and the same number. This lift weighs 321 tons, and will throw an extra pressure of about 2·3 inches of water.

### Third Lift.

This is again 3 feet larger than the second lift, and the grip carriages are smaller; but in other respects it is identical with the second lift. Its weight is 307 tons, giving an extra pressure of about 2·16 inches of water.

### Fourth or Outer Lift.

In this lift, which is 282 feet in diameter and 42 ft. 6 in. deep, there is a hydraulic grip formed out of the top row of plates exactly like those on the second and third lifts. The bottom curb is subjected to bending stresses and must therefore be stiff. This bottom curb is formed of a 10 in. by $\frac{3}{4}$ in. steel plate fixed at right angles to the side sheets by a 4 in. by 4 in. by $\frac{3}{4}$ in. steel angle, and also a ring of 8 in. by $3\frac{1}{2}$ in. steel channel set edgeways to the side of the holder, 15 inches above the bottom plate. The bottom roller carriages are fixed between the channel and the bottom curb plate, thereby stiffening both. The curb plate is also stiffened by steel gusset brackets underneath; these brackets being attached to the channel steel guides inside—one opposite each of the 32 channel guides fixed to the side of the tank. In addition to these, and midway between the bottom curb carriages, additional steel brackets are fixed between the ring of channel steel and the curb plate. All this stiffening reduces to a minimum any tendency to buckle.

The bottom row of plates to this lift is $\frac{1}{2}$ inch in thickness and 2 ft. 6 in. deep; the next row being $\frac{1}{4}$ inch thick and 2 ft. 11 in. deep; all the intermediate rows being of No. 9 imperial standard gauge and 3 ft. 2 in. deep—all rows being measured from centre to centre of the rivets. All seams are provided with linen tape of sufficient width, well smeared on both sides with red lead before riveting up. The guides and stiffeners to this lift are similar to those on the other lifts. The grip carriages are in this case fixed to the side of the grip, instead of the top. This allows the carriages to the other lifts to be brought lower down, and so save height and weight. There are only radial rollers to these carriages. They are $10\frac{1}{2}$ inches in diameter by 5 inches wide, and have axle pins of hardened steel, $1\frac{1}{2}$ inches diameter, reduced to $1\frac{1}{4}$ inches at the ends. All the carriages have slotted holes in the cheeks to allow for roller adjustment. Steel wedges are used for these carriages, as for the cup carriages previously described. The bottom curb carriages are practically the same as those on the grip. Their rollers work up and down the channel steel guides fixed to the tank wall.

The weight of this lift is about 307 tons, and gives an additional pressure of 2·1 inches of water. The total floating weight of the holder, when fully inflated, is about 1607 tons. To this must be added the weight of the water in the cups. A total of almost 12 inches of water is the pressure then obtained for the holder fully inflated. This will apply when the holder is stationary and free from snow or wind pressure. Either of these, and friction of rollers, will affect the actual pressure in some degree. A gale is often registered on the charts of the governors by a wavy line caused by the oscillations of the pencil; these oscillations being produced by pulsations in the mains corresponding to strong

gusts of wind on the holders—the gas in the mains being the medium by which these pulsations are conveyed.

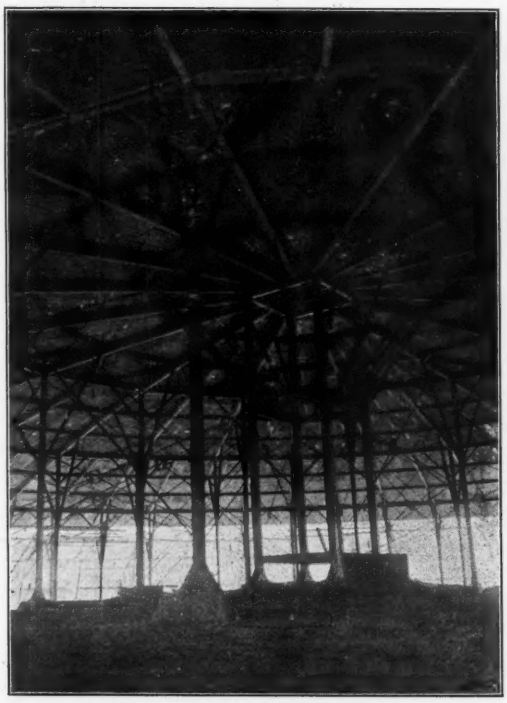
### Factors Influencing Gasholder Design.

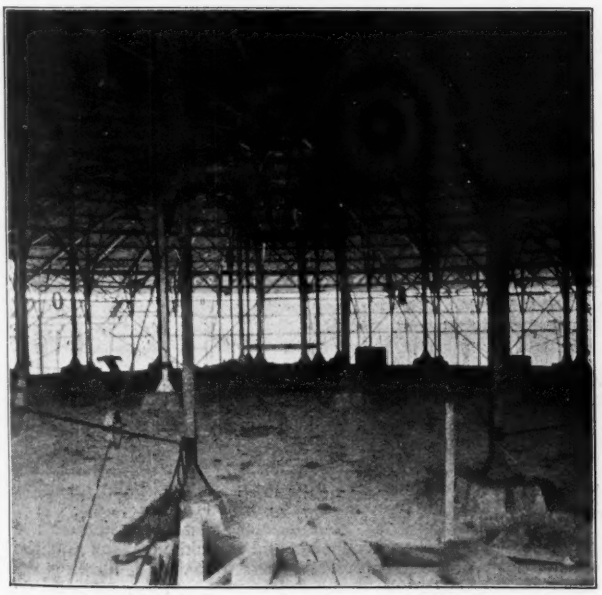
Before passing on to describe the guide-framing, a few of the factors influencing gasholder design will be dealt with. With gasholders, as with ships, there are centres of gravity and buoyancy. The centre of gravity is the point at which the whole weight of the gasholder is supposed to act vertically downwards. The centre of buoyancy is the point at which the whole of the upward pressure of the gas is supposed to act, and is generally below the centre of gravity; the only exception being when the first lift is but a few sheets out of the water. Therefore, there is almost always present a tendency to overturn. The overturning would take place with the slightest force acting sideways if some method of guiding the holder were not used; and the greater the tilt, the more unfavourable the conditions become for equilibrium. Guiding in some form or other is, therefore, absolutely necessary to maintain equilibrium. If guiding were not provided above the tank, and only one circle of rollers were used—viz., those rolling up the tank guides—the holder would revolve about two of the bottom rollers diametrically opposite, gas would escape from one side, and the other side would crash into the edge of the tank, and perhaps buckle up.

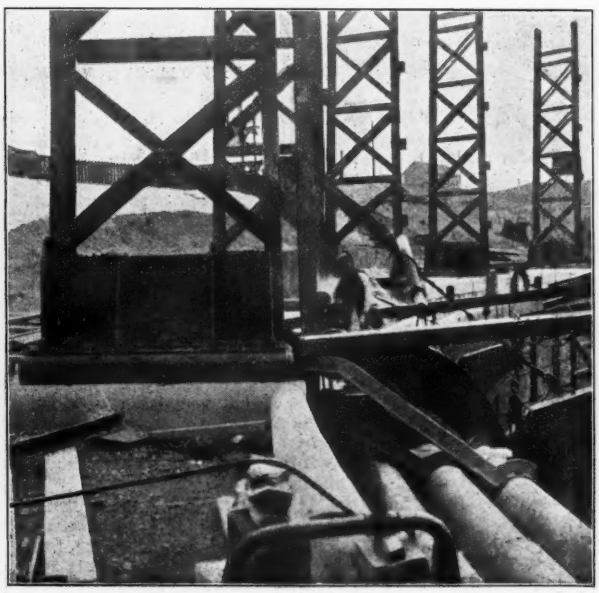
The forces tending to overturn a holder are snow and wind. The tendency of the wind is to produce a certain amount of wedge action and to flatten the holder into an ellipse. As stated previously, the curbs take up the stresses in the holder itself for the most part. The cups and grips, and even the sheets themselves, also come in for their share of the stresses. If the vertical stays and guides in each lift are well secured to the sheeting, as in this case, the spring and the racking are reduced to a minimum, and greater rigidity, with less tendency to distortion of the lifts, is obtained. In some holders the vertical stays are only secured top and bottom. Hence, there is very little in the way of a stiffened web to take up the shear except thin sheets, which are only kept straight by the weight suspended from them.

The tension in the crown sheets varies "directly as the radius of the sphere of which the top is a segment and as the pressure of the gas;" and it is the same in all directions. This is proved by Mr. Cripps in his book on the subject. It will be noticed that there is no trussing to the crown of the holder; the tank framing in this case supporting the crown sheets when the holder is empty. In smaller holders, trussing in the form of a huge umbrella frame is provided. It might be asked why such a trussing is not used in this case. In answer to this, I cannot do better than quote from Mr. Cripps's work. He says:

**It is easy to show that the advantage of an untrussed top is greater in a large gasholder than in a small one; for the separate frame built in the tank does not require to be much stronger, however large the gasholder may be made. In other words, the framing for carrying a 200 feet top need not be any stronger, area for area, than for a 100 feet**







**Constructional Details of the Holder.**

top; the only difference being that there is four times as much area to support. But with a trussed top, a 200 feet gasholder not only requires four times as much trussing as a 100 feet holder, but (owing to the increase of span) it must also be made of much stronger sections in order to carry itself. It is, therefore, much heavier in proportion. It follows, then, that there must be a limit beyond which it is decidedly uneconomical to adopt a trussed top; and this limit can only be determined by comparing the cost of two plans of gasholders of the same size.

As a general practice, holders 150 feet in diameter and over have untrussed crowns. There is undoubtedly greater stress in the curb with an untrussed crown than with a trussed crown; but the extra metal required is very small compared with the saving in weight in the framing. Further, it is not desirable to have too great a pressure, as this pressure only throws more work on the exhausters, and is objectionable to a certain extent in other ways. In calculating the effective wind pressure on the holder, due allowance must, of course, be made for the circular shape of the holder, and for the fact that the wind pressure at the ground level is much less than at a great elevation. At the Forth Bridge, the pressure recorded at a height of 70 feet was 12 lbs. per square foot; at 210 feet, 11 to 15 lbs.; and at 375 feet, 15 to 24 lbs.

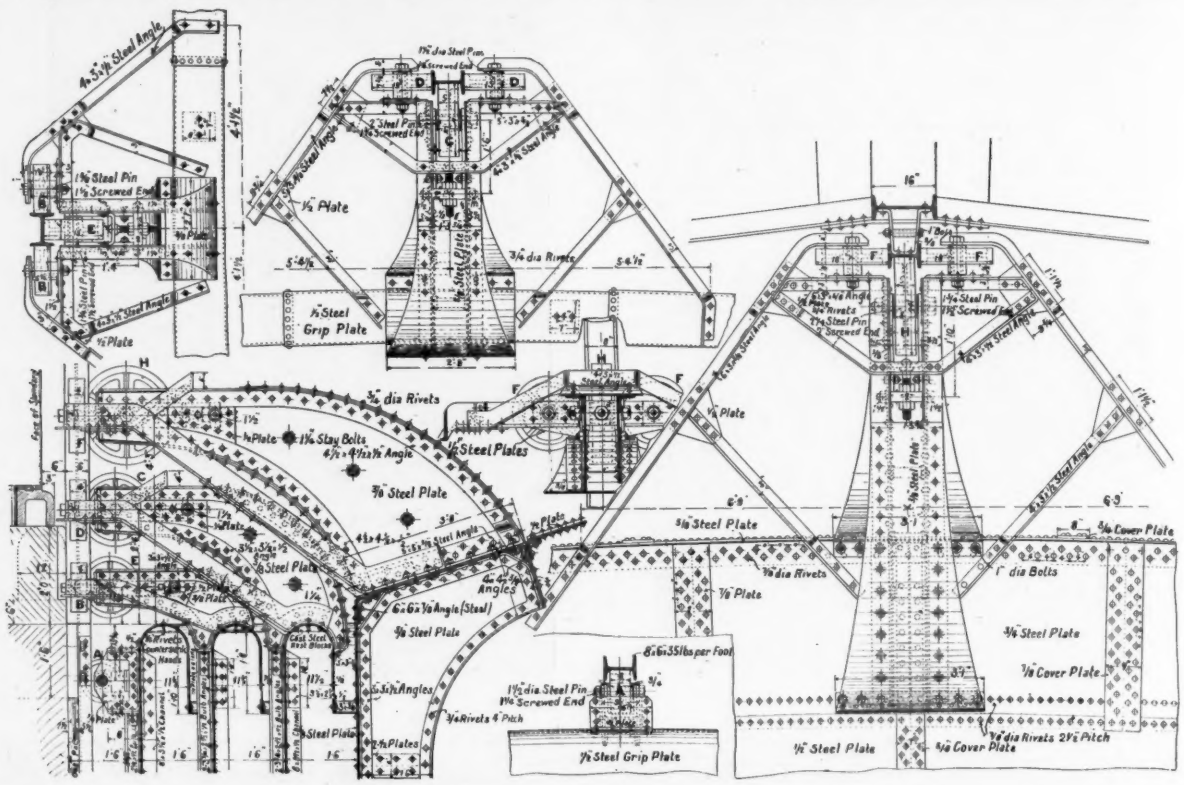
### Guide-Framing.

Having now dealt with the gasholder itself, we will turn our attention to the guide-framing.

The guide-framing consists of 32 steel standards, each firmly bolted to a masonry pier of the tank with six 3 inch diameter bolts 13 ft. 3 in. long; the bottom ends being held together by a $\frac{7}{8}$-inch steel plate built into the brickwork. The bracing between the standards consists of six tiers of horizontal lattice girders and diagonal bracing between. Each standard is 168 feet high over all, 7 feet deep at the base and 2 feet at the top, and is composed entirely of steel sections. The front and back members are of H section, 16-in. by 6-in. by 62 lbs., united by horizontal struts of 6-in. by 4-in by $\frac{1}{2}$-in. tees, and diagonal flat bars $\frac{1}{2}$-inch thick, varying in width from 6 inches at the foot of the standard to $3\frac{1}{2}$ inches at the top. Side plates of $\frac{3}{4}$-inch are provided at the foot, further strengthened with gussets secured to the bottom plates. These bottom plates are 1 inch thick by 4 feet wide, and are secured to the side plates by steel angles; the rivets being countersunk below. The standards are erected on cast-iron base-plates 4 ft. 6 in. wide by 7 ft. $11\frac{1}{2}$ in. long and $8\frac{3}{4}$ in. deep, of 2-inch metal. On the top of each standard are riveted two steel angles attached to the top plate of steel, 2 feet wide by $\frac{1}{2}$ inch thick, and projecting over the front of the standard to cover the end of the guide—being attached by angle brackets.

At the junction of the girders with the standards, large junction plates are riveted to the back and front limbs of the standards for securing the girders and bracing. The plates on the back or outside on the first two tiers from the ground are $\frac{3}{4}$-inch thick, on the third and fourth tiers $\frac{5}{8}$-inch thick, and on the two top tiers $\frac{1}{2}$-inch thick. The plates on the front are all $\frac{1}{2}$-inch thick. The overall sizes of these plates also vary according to position. To fill up the space between the plates and the web of the joists forming the standards, cast-iron blocks are provided.

Of the six tiers of girders, five are horizontal lattice girders




**Details of the New Manchester Gasholder—Top Curb, Grips, Guide-Carriages, &c.**

composed of steel channels and angles; and the sixth or top tier is box-shaped and latticed. The top girders are 4 feet deep by 2 feet wide, and are composed of four angles, 6 in. by 4 in. by $\frac{1}{2}$ in., joined together by $\frac{1}{2}$-inch flat steel lattice bars on all sides. The intermediate tiers are formed of two steel channels 12 in. by $3\frac{1}{2}$ in., united top and bottom by steel angle lattice bars, the largest bars being on the lowest and widest girders. The width of the girders varies according to their position, and is slightly less than the standard at the place where they join the standard. These girders are attached to the standards by $\frac{1}{2}$-inch steel plates riveted to the T-steel struts of the standards, and also attached to the junction plates back and front.

The diagonal bracing consists of flat bars. The first four tiers have bars $\frac{3}{4}$-inch thick and varying in width from 9 inches at the bottom to 6 inches at the fourth tier. The remaining tiers have bars $\frac{1}{2}$-inch thick; those in the fifth tier being 5 inches wide and in the top tier 4 inches wide. All bars are in one length, and are riveted at crossings. The ends of the bracing bars are riveted to the junction plates by $\frac{7}{8}$-inch rivets.

The guides forming the path for the carriage rollers are formed of H section steel, 8 in. by 6 in. by 35 lbs., secured to the back of the standards by brackets of $\frac{5}{8}$-inch steel plate, 1 foot long, fixed 6 ft. $8\frac{1}{4}$ in. centre to centre. The radial rollers of the carriages travel up and down the web, while the tangential rollers travel up and down the flanges. To illustrate the great pressure on the tangential rollers on a large holder, the flanges of similar guides on the existing 7 million cubic feet holder at Bradford Road have been bent $\frac{1}{2}$ inch away from their true position; having received a permanent set of this amount.

For the purpose of reaching the crown of the holder when in any position, in two opposite bays are ladders and platforms, one platform on each tier of girders.

To prevent the freezing of the water in the cups in winter time, two complete sets of Cutler's anti-freezing apparatus are provided.

The total weight of the guide-framing and holder complete is about 3080 tons; each standard and its guide weighing 30 tons. The tank framing and inlet and outlet pipes are painted with three good coats of red-lead paint. All the external work is painted with two good coats of red-lead paint, and one finishing coat of William's "Viternus" paint. The whole of the work received one coat of paint before delivery. In our experience in gas-works, we find red lead to be the most satisfactory paint for steel work. To avoid discoloration from sulphuretted hydrogen, a finishing coat of some other paint free from lead, and possessing a similar rate of expansion, may be applied as in this case.

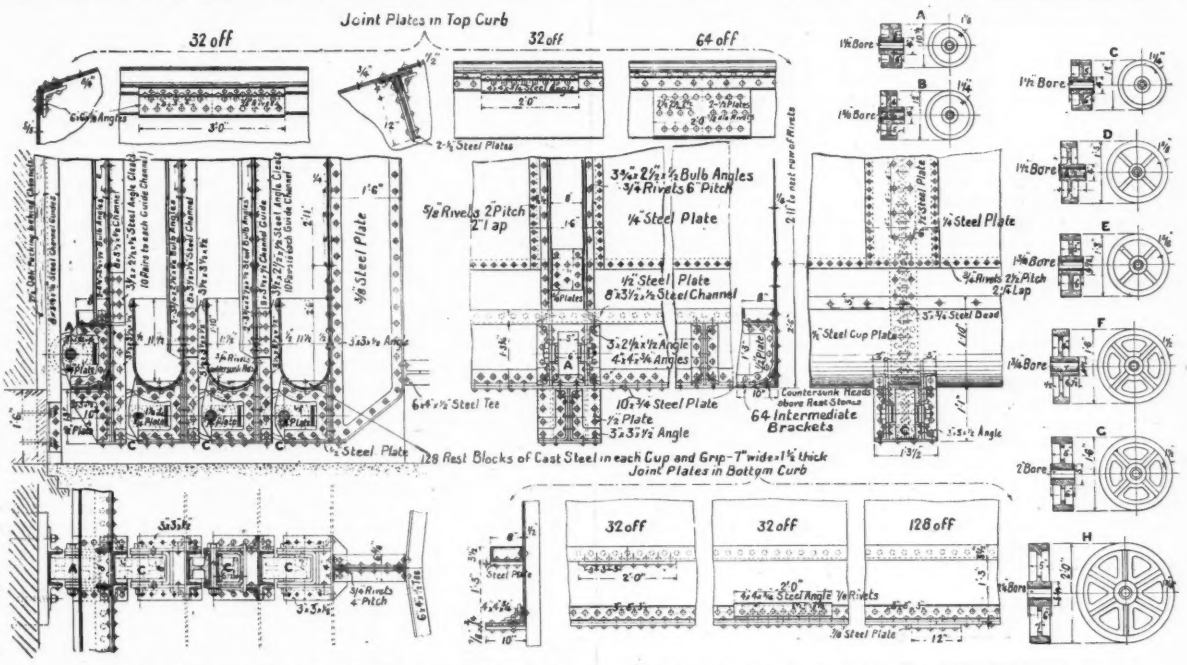
The stresses to which guide-faming may be subjected are somewhat complex, on account of the huge dimensions and the circular form of the structure. When a high wind is blowing, the effect produced is to drive the holder against the standards on the leeward side, and throw these into compression and those on the windward side into tension—the whole framing being con-

sidered as a vertical cantilever of circular form. The horizontal girders are therefore the struts and the diagonal bracing the ties. To find the true moment of inertia of this huge cantilever is a very complicated process if extreme accuracy is required, as the standards are not symmetrical, and each is at a different angle to the neutral axis. With circular columns, it would be simpler, but with built-up standards every standard requires different treatment. The question as to whether the framing should be treated as a vertical cantilever, or whether the standards should be considered as independent posts tied together, is dependent upon design. The greater the amount of the bracing, the truer the cantilever theory becomes. There is then very little stress on the standards; but owing to the elasticity of the steel, and the inevitable springiness of the structure as a whole, and the imperfect contact of bell with frame, it seems more likely that a light standard on the leeward side would collapse by buckling, although theoretically strong enough for purely compression stress, before any great tension could come on to the one on the opposite side. This being the case, it appears the safer plan to consider this particular guide-framing as coming between the multipost type and the cantilever type, and give the standards plenty of lateral support in the way of cross girders and ties, and plenty of depth from front to back. For these reasons, the cross girders are, with the exception of the top tier, fixed flat, and occupy the whole depth of the standards at the points where they join them.

The force tending to distort a gasholder out of the true circle, and thus produce a bending moment upon the standards, was assumed by the late Sir Benjamin Baker, on the Old Kent Road 8½ million cubic feet gasholder, designed by the late Sir George Livesey, as being "equal to 14 lbs. pressure per square foot when distributed over a surface equal to about three-fourths the total depth of the holder multiplied by the distance between two columns or standards." This 14 lbs. is the figure obtained after allowing for the circular form of the structure, and for the assumption that the pressure is not the same over the whole of such a large surface at the same moment, and that the pressure varies according to the height. In addition to wind pressure, allowance must be made for the tilting effect of the snow on the leeward side of the crown, which will also cause an extra thrust on the carriages on this side, and so increase the bending moment on the standards. Also, the dead-weight per standard must be taken into account. In this case, it amounts to close upon 63 tons per standard, including the proportion of load due to bracing.

Summing up all these forces acting on the standards, and assuming the worst conditions, we get as a maximum compressive stress, 7¾ tons per square inch, using Cripps's formulæ for the whole cantilever. This may appear somewhat high; but it is assuming that the whole force of the wind and snow to be concentrated on one standard or point in the circle. As this is extremely unlikely with 16 carriages in the half circle on each lift available for taking up the wind pressure, the stress will be distributed, and therefore much less than 7¾ tons per square inch, and thus perfectly safe.

If the framing be considered as belonging to the independent column or multipost type, the stress becomes about 5½ tons per square inch at the base of the standards. The stress on the bottom row of ties works out at 5½ tons per square inch. On the bottom tier of girders or struts, the stress is about 2 tons per square inch; the safe working load for a strut of this section and length being about 3·6 tons per square inch. It will be seen that there is ample margin of safety. In the neighbourhood of the




**Details of the New Manchester Gasholder.—Bottom Curb, Cups, Curb and Cup Carriages, Guides, Cast-Iron Rollers, &c.**

Bradford Road, the air is highly charged with acid and other corrosive agents from the chemical works in the vicinity. It is therefore imperative to have plenty of margin if the structure is to resist corrosion for any length of time. The sheeting is also, for this reason, made thicker than might be expected.

### Method of Erection.

The general design of the structure having now been dealt with, the method of erection will be briefly described. On completion of the tank, the steel framing inside and the tank-guides were fixed. These were followed by the fixing of the curb of the outer lift on the rest-stones. Then the vertical guides and the stiffeners, with their plates, were fixed to the curb, and the sheeting followed—being finished off with the grip. Six or eight sheets are sent from the shops riveted together, to save a great amount of handling on the site. This order was followed in the next two lifts; the only difference being that the cup in these cases took the place of the curb on the outer lift. The inner lift was run up in a similar manner, with the vertical stays all fixed; and the top curb was completed before the crown sheets were attached. The laying of the crown sheets was commenced at the centre, and will join up to the curb shortly.

The guide-framing may be erected any time. The standards are to be run up in sections, and braced by the cross-girders as they rise. Up to the present, the first tier of girders has been reached. The other sections will be erected as the holder rises during testing; the crown of the holder being used as a scaffold. The carriages and rollers may be put on at any time after the first tier of girders is fixed; final adjustments being made when the holder is inflated with air.

All the charges of plates and bars were inspected and tested at the steel works prior to dispatch, and marked with a stamp; the quality satisfying the specification of the British Standards Committee.

The $\frac{5}{16}$ inch rivets are put in cold. Those on the side sheets are put in from the outside, and hammered up flat on the inside. Those in the crown are put in from the inside and hammered up outside. All riveted joints are provided with broad, linen tape soaked in red-lead paint; the faces of the joints being also well painted before the tape is inserted.

When completed, the gasholder will be tested with air and raised to its full height; the guide rollers being carefully adjusted as it rises, and then fixed. It is to remain at its full height for not less than three days and any leakage stopped. It is then to be emptied of air and filled with gas, and must remain filled for 48 hours without leakage, and must work satisfactorily in every way before being taken over by the Corporation. It is expected that the holder will be ready for use next winter.

### General Conclusion.

The holder is one of the largest in the world; coming third in point of cubical contents—only those at New York and at East Greenwich being larger. The New York gasholder is 15 million cubic feet capacity; that at East Greenwich is 12 millions.

The Contractors for the holder and guide-framing are Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees. They were also Contractors for the 7 million cubic feet holder at Bradford Road.

In conclusion, the author has again to express his great indebtedness to his Chief, Mr. J. G. Newbigging, M.Inst.C.E., who is

responsible for the design of this mammoth structure, for permission to read this paper and submit the original working drawings which accompany it.

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The meeting was held last Wednesday at which the foregoing paper was read. Prior to the meeting, the members paid a visit to the site of the new holder, which, as readers may remember, is in course of erection at the Bradford Road station.

Mr. D. C. RATTRAY, who occupied the chair, remarked that there was no need for him to introduce Mr. Robinson, who was known to all, and had in hand a most interesting subject.

Mr. ROBINSON then read his paper.

Mr. R. COTTON, in opening a brief discussion, said he should like to know whether, in estimating the total stress thrown by the holder owing to various agents, the result was arrived at graphically or mathematically. The author of the paper had stated that there were 100 pages of matter in a certain book on the subject, and it would be interesting to know whether they used much of it when devising the structure described, or relied on first principles. He personally thought theory could be hopelessly overdone; practice was the great thing. He thanked Mr. Robinson for his observations on the subject of the centre of buoyancy and gravity. The remarks as to the pressure of the wind were particularly interesting to him, as he had had charge of the meteorological station at Glossop, and he then found that the higher the velocity was taken, the greater the force of the wind. It would about double its velocity in 1000 feet.

A MEMBER asked if there was ever any trouble from leakage in the crown of the holder, and, if so, how it was detected.

Mr. A. BOWES said, as far as he could see, the details of the holder described were highly commendable; and if there was to be any criticism of them, it should come from a man who had carried out something bigger. The largest holder he had constructed was 100 feet in diameter, with three lifts; and the details were almost identically the same as in the one before them. One great difference he noted, however, in this was that the tops of the standards and guides finished at the top of the lifts; while the previous method was not to go so far. He would like to know the reason for this. In constructing so large a crown to spread over the area of an immense tank, he assumed that the work of trussing would be carried out in arithmetical ratio proportionate to its weight and the weight of gas the holder would contain.

Mr. ROBINSON, replying to the remarks made, referred to the question of whether the stress was estimated graphically or mathematically, and said they adopted Mr. Cripps's method of doing it both ways; but it was obvious that when they had a large structure they must rely mainly on a mathematical system, at the same time taking into consideration probable wind, snow, &c. The question of wind pressure was one of the most difficult to deal with. The weight of pressure was largely dependent on the weight of the holder. As to the method of finding a leak in the crown, the usual way was to wash it with thick soap and water; and if there was a leak of gas, it would cause a bubble to rise. Men were stationed on the top of the holder to look out for bubbles; and if one appeared, they immediately set to work to caulk up the hole. In reply to Mr. Bowes, he might explain that the reason the standards were carried so high was because it was considered that in constructing a holder of the magnitude of that described, with four lifts, it was necessary to increase the rigidity of the lifts.

A hearty vote of thanks was accorded to Mr. Robinson.

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## RECENT PROGRESS IN ELECTRIC LIGHTING.

At the Meeting of the Illuminating Engineering Society last Friday—Dr. SILVANUS P. THOMPSON presiding—Dr. E. W. MARCHANT, Professor of Electrical Engineering at the Liverpool University, read a paper bearing the above title.

The author said the paper was an attempt to give some account of recent developments in electric lamps rather than one on recent developments in electric lighting. The most remarkable development within recent times is the production of an incandescent lamp with an efficiency approximating to 1-candle power per watt; and the most recent development in the construction of tungsten lamps is in the use of wire-drawn filaments. It is claimed that these filaments are mechanically stronger than those in which the thread is obtained by deposition of the metal, or by some process equivalent to it. One of the chief drawbacks to the use of tungsten filaments has been their great fragility; but in this connection it should be noticed that the filaments are not very fragile, except when cold. Metal filament lamps stand a great deal of vibration when they are in use; whereas the same lamps when cold are soon broken under similar conditions. Another point connected with the fragility of these lamps is the effect of switching off and on. In order to test a statement that has been frequently made as to the bad effect of switching off and on, a series of tests are now being carried out in the Electrical Engineering Laboratories at Liverpool. As far as these experiments have gone, the effect of switching does not appear to be serious; the lamps that have been burning continuously have given out to the same extent as those that have been subjected to continuous switching off and on.

It is very difficult to get definite information as to the effect of vibration on the life of metal filament lamps. There seems to be little doubt that vibration is injurious, though there is reason to think that its effect has been greatly exaggerated. A large number of lamps in the author's laboratory are hung from a light roof supported on an upright girder, on which countershafting is carried. These lamps have now been in place for over a year, and are lit on the average during the winter for from two to three hours every evening. So far, not a single lamp has given way. It is probable that metal filament lamps are much more injuriously affected by the sudden shocks they receive when their globes are being cleaned than by any ordinary vibration to which they may be subjected. At the same time, vibration must be injurious in certain cases.

One may sum up the position so far as metallic filament lamps are concerned by saying that at present there is no difficulty in obtaining a 230 volt metal filament lamp of about 25-candle power which will give 1 horizontal candle-power for 1·2 watts, and will burn near this efficiency for over 1000 hours—probably for a much longer period under ordinary conditions.

So far as improving the illumination given by lamps is concerned, as much may usually be done by using suitable shades as by improving the efficiency of the lamp. By using suitable reflecting shades, a great increase in illumination may be effected by reflecting light (which would otherwise be wasted) in the direction where it is wanted. In modern systems of lighting, it is now becoming increasingly recognized that it is necessary to screen the direct image of the lamp filament from the eye. The intrinsic brilliancy of such a filament is very high; and the image formed on the retina is now recognized as producing an unduly severe stimulus, which, if often repeated, may prove injurious. This point is now so well known that it is unnecessary to labour it further, except in so far as it implies the necessity of using either a frosted lamp or a reflecting globe. The latter may be used to divert any wasted light in the direction in which it will be most useful; and from this point of view the question of light distribution becomes less important to manufacturers of lamps.

The most notable advance in arc lighting, within recent years, is the flame arc; but these lamps have been used so extensively for a number of years that the flame arc itself is far from being a recent development. With one exception these lamps all give off a good deal of fume and vapour (which makes them unsuitable for indoor lighting), and developments have been mainly in the direction of making them suitable for street lighting.

The author proceeded to deal with these two points: (1) The improvements made in the distribution of light so as to give more uniform illumination over a large area; (2) the actual efficiency or flux of light emitted per watt consumed in a modern lamp. We will not follow him into this part of his subject; except to say that he emphasizes the necessity of distinguishing clearly between the two factors—light distribution and light efficiency. They are obviously quite distinct and different. However great the improvement in distribution of the light that can be effected by altering the globe, this improvement can never go beyond the point at which the whole of the light produced is used in the most economical way. If further increase in illumination is required for a given expenditure of power, it must be obtained by increasing the total flux of light from the source. Inverted arcs for interior lighting appear to be much less used than formerly, and those who have had trial of metal filament lamps for lighting drawing offices and other similar places have no great difficulty in understanding the reason for this. The best arc lamp cannot compare with metal filament lamps as regards steadiness of burning; and most arcs, from the flickering character of the light they emit, even when burning under the most favourable conditions, are quite unsuitable for drawing office lighting. Another point which has led to their abandonment for interior lighting is the labour involved in renewing carbons. When a large number of lamps are used, as for street lighting, this difficulty is not serious, since a special staff is employed to carry out the necessary renewal of carbons. Further, with inverted arcs, there is not a great gain in efficiency of lighting, as compared with direct—*i.e.*, non-reflector—metal filament lamps. The main field of utility for arc lamps is street lighting; and it is for this purpose that the greatest progress has been made in their design. It may be desirable to mention the magnetite lamp which is used so largely in America, and it is to be hoped that some further figures with regard to its efficiency may be forthcoming.

The production of light from an incandescent vapour is a method of lighting which has long been familiar, though the only practical examples of it are the mercury vapour lamp and the Moore tube. In the Quartzlite lamp, the tube in which the mercury and the mercury vapour are contained is, of course, of quartz. The main characteristic of this lamp is that it produces a large amount of ultra-violet light, to which quartz is transparent, and which is screened off from the exterior by a heavy lead glass cover. If the lamp is left burning without this cover for a few minutes, the smell of ozone produced is very strong. It is a matter for discussion whether this type of light containing these very strong lines only in the spectrum, will not ultimately prove injurious to the sight of those who are obliged to work in it. It would *à priori* seem to be bound to produce a fatigue of those parts of the retina which respond to the impulses given by the particular rays which the lamp emits. A lamp of this type has recently undergone test in the author's laboratory, with the result that the efficiency worked out at 1·73-candle power (mean hemi-

spherical) per watt. The lamp consumed 688 watts at 230 volts, and gave a mean hemispherical candle power of 1190. The chief drawback to all mercury vapour lamps is the remarkable colour effects they give with coloured objects. In this regard some reference may be made to the recent work of Mr. H. E. Ives. The interesting result was found that the Welsbach gas-mantle provided a very satisfactory complement to the light produced by the mercury vapour lamp when the resultant light of each source was in the ratio of 1-candle power mercury vapour to ·57 candle power of Welsbach gas-mantle; the mantle having ¾ per cent. cerium. The mixing of the mercury vapour light with that of the light from tungsten lamps has been tried at Liverpool with quite satisfactory results. The Moore tube has not been used very largely in this country for lighting purposes.

Professor G. W. O. Howe, in the course of a note, said: Three years ago a number of Osram lamps were installed in the lecture theatre of the Electrical Engineering Department of the Central Technical College. The supply pressure being 200 volts, the lamps were connected two in series. Three pairs consisted of 110-watt lamps. At their normal voltage they take 100 watts and give only 36 mean horizontal candle power after a life of well over 1500 hours. Their specific consumption is therefore 2·8 watts per candle. Before the lamps had been running long, it was noticed that some of them had blackened considerably; and, on examination, it was found that the upper part of the bulb—*i.e.*, the part near the cap—was heavily coated with brilliant copper-coloured deposit. When recently examining this deposit, a very peculiar thing was noticed. A relatively clear unblackened pattern had been made on the globe, indicating that the blackening had been caused by particles projected from a single joint. By careful examination, it can be seen that the point from which this bombardment proceeds is the joint where the filament is connected to one of the leading-in wires. This is the point at which two of the three broken lamps have given way. Pear-shaped Osram lamps of smaller candle power which were installed at the same time are not so blackened, and show no sign of a pattern. The question which naturally arises is: Of what is the deposit composed? Mr. Robertson, of the Central Technical College, has kindly examined it, and finds it to consist mainly, if not entirely, of copper. The leading-in wires are found upon analysis to contain a certain amount of copper. The small lamps must differ in some way from the large ones, or we should get the same phenomenon in them. If the methods or materials of manufacture have not been altered since these lamps were made, it is evidently possible for the makers, by excluding copper from the joints, to reduce the blackening to a large extent; and at the same time to reduce the probability of breakage. All the lamps which show this phenomenon bear the inscription: "Made in Germany."

In the course of the discussion, Mr. A. P. Trotter spoke of the amount of light that one really requires. He rather resents the metallic filament lamp, because he is on a 205-volt system; and he cannot have anything less than a 20-candle power lamp. In his office, he has the "luxury" of an old-fashioned carbon filament lamp. He much prefers it to the high-power metallic filaments. There was a reference in his remarks to the necessity of keeping voltages steady; and there was a little reminder as to his work in connection with dioptric globes when he said: "I have had to wait thirty years before my invention of dioptric shades has been again heard of." It was mentioned by Mr. Haydn Harrison that he has tested many thousands of high voltage metallic filament lamps on the photometer; and generally the average efficiency is about 1·37 watts per British candle. On the point of the fragility of these lamps, Mr. A. H. Seabrook said that he has found that, in cleaning street lamps, if they are lighted up, the life is greatly increased; and this applies, too, to domestic lighting. Speaking of Holophane reflectors and globes, he remarked that experience with them the last twelve months has produced some extraordinary effects. They have had in Marylebone consumers who were using (say) 50-candle power lamps who said the consumption was too great, and they could not afford it. Using Holophane globes, the wattage consumption has been cut down one-half, by directing the light where it is wanted and not wasting it on ceilings and the walls where it is not required. In shop lighting, they have also been able to effect considerable improvements the same way. He believes gas and electric lighting people realize the enormous amount of educational work there is to do in illumination better than anyone else, for every day they see the atrocious methods of illumination that are carried out. Against absolute uniformity in street lighting, Mr. Wilkinson spoke—for example, more illumination is required at street corners. The utility of the flame arc lamp for street lighting purposes only was contested by Mr. Justus Eck, who knows that it is being used for factory lighting. Professor Morris told of an experience he has had with some tantalum lamps in a kitchen and a passage. In the hot place, one lamp went about every four weeks, while in the passage outside, where the temperature was not so high, the lamps had a greater life. Tungsten lamps are now used in the kitchen, and they run about ten months. On the question of the proper lamp to be used in fogs, he stated that, in connection with one of our docks on the river, it is now being considered whether a series of flame arc lamps should not be taken out and high-pressure gas-lamps be put in, on account of the large amount of white mist fogs on the river.

Mr. Leon Gaster, Mr. Waldram, Mr. Rawlings, Mr. Dow, and others contributed to the discussion.

## CONTROL OF THE WORKING OF GAS-WORKS.

At the Meeting of the Mid-Rhenish Association of Gas and Water Engineers at Gmünd in September last, a paper was read by Dr. Karl Bunte, of Carlsruhe, on the "Control of the Working of Gas-Works." The Mid-Rhenish Association decided at its meeting in 1908 to ask the Experimental and Instructional Gas-Works of the German Association of Gas and Water Engineers to undertake the regular control of the working of the moderate-sized and small gas-works in the Mid-Rhenish district. Dr. K. Bunte, in his paper, describes what has been done by the Instructional and Experimental Works in this direction in the course of the past year.

In most cases the work was confined to investigations made with the object of exercising control on the ordinary working of the gas-works; but in a few instances special difficulties were studied, and in other cases efficiency trials of new plant on its delivery were carried out. The tests for the control of working were made for the most part by simple methods applicable on any works; but the opportunity was taken to familiarize the engineers and foremen with such tests, and to indicate to them the significance of the results obtained. The object was to inculcate the practice of making regular tests for the control of the working; and the endeavour was made to utilize as far as possible existing apparatus and appliances on the works. Some details of the nature of the investigations carried out with this purpose in view may be quoted from the reprint of Dr. Bunte's paper in a recent number of the "Journal für Gasbeleuchtung."

The retort-settings are in the first instance tested to ascertain whether the combustion of producer gas is proceeding properly. An analysis of the flue gas at the entrance of the regenerative passages is made. The sample is taken midway between successive clinkerings of the producer, and not immediately after making-up the fire or recharging the retorts. If 18 per cent. or more of carbonic acid and a small excess of air are found, combustion is regarded as quite satisfactory. The main point is to make the examination at a time when the firing of the settings is proceeding in average conditions. In the second place, investigation is made as to whether the formation of the flame is taking place in the proper manner. In most cases, this is ascertained by means of temperature measurements with the Wanner pyrometer in different positions in the setting. The differences of temperature should not be more than about 145° Fahr. above or below the mean. Frequently a very high temperature, approaching the fusing point of the fire-brick, is found immediately above the nozzles or burners, while the outer retorts are only moderately hot. In this case, the flame produced is not sufficiently long. An analysis of the producer gas will then commonly show that there is too much carbonic acid in it, due to the reducing layer of the fuel being too shallow. As a consequence, but little secondary air is required and the flame is short. In this case, the producer should be charged more frequently.

In other instances, though the proportion of carbonic acid may be low, there is a comparatively small quantity of carbonic oxide because insufficient water vapour has been introduced. The result is that the temperature in the producer is too high, and there is rapid combustion where the producer gas mixes with the secondary air. This condition is rectified by increasing the supply of steam to the producer. Occasionally, also, a too short flame is due to constructive faults, as when the producer gas and the air meet at an obtuse angle and, mixing rapidly, burn locally. It is rarely possible for the experimental works to do more than indicate to the officials of the gas-works the fault in the procedure, and the subsequent regulation has generally to be left to the works' superintendent to carry out. It is considered very important that the experimental works should be advised of the success or failure of the measures which it has recommended.

A third point in the checking of the working of retort-settings is the investigation of the soundness of the regenerative passages. Where there are a large number of similar settings in a bench, the faulty setting may generally be located by observation of the draught at the outlet. If most of the settings require a draught of (say) 3-10ths, and one of them requires 5-10ths, unsoundness of the regenerative passages in the latter may be safely inferred. In the same way the defective side of the particular setting may often be ascertained, and the conclusion verified by analysis of samples of the flue gas taken at the inlet and outlet of the regenerator. An abnormal diminution in the draught or a considerable difference in the amount of carbon dioxide at the inlet and outlet of a regenerative passage will indicate that the latter is unsound and requires repair. In some cases where a proper temperature cannot be attained, though the combustion is good and the consumption of fuel ample, it will be appropriate to ascertain the quantity of undecomposed steam in the producer gas; and this may be done by aspirating some of the gas through a weighed tube containing calcium chloride. Attention may be called to the fact that many settings have too few sight holes (and these are often in the wrong positions); while no provision is made for taking samples of the gas from the setting.

The control of the condensation of the gas made is very important in its bearing on the subsequent purification of the gas and on the extraction of naphthalene. Condensation begins in the ascension pipes, which should not be regarded as connections

merely between the retort and hydraulic main. The gas leaves the retorts at a temperature of at least 570° Fahr., and has to pass through the water seal and deposit a portion of its contained aqueous vapour without evaporating the water in the hydraulic main. Consequently, the temperature in the bridge-pipe should remain below 212° Fahr. The more recently-formed coals contain the most water; and hence the temperature in the bridge-pipe would be higher with them than with the older coals. The condensing action of the ascension pipes is only secured when they are kept clean. Deposits on them diminish the transference of heat; and, if they are present, the gas will be too hot when it reaches the hydraulic main, and instead of depositing water will take it up, with the result that in extreme cases the dip-pipes become sealed with tar instead of with water. The light oils and naphthalene are then volatilized from the tar, and thick tar or pitch is produced in the hydraulic main, and naphthalene stoppages occur in the subsequent apparatus. The temperature in the hydraulic main should not exceed 140° to 150° Fahr.

Care must be taken in regard to two points in the subsequent condensation. In the first place, the gas must be cooled uniformly and not suddenly, so that the naphthalene and the tar oil may be separated as much as possible together; while, in the second place, it is very important that the naphthalene should be deposited on cooling surfaces which are washed by the condensed tar, and not separated in the free-way of the gas. If two streams of gas of very different temperatures are mixed, the naphthalene separates in the form of dust as it passes direct from the state of vapour into the solid state. It is well known that liquids absorb substances in the condition of dust imperfectly, as is well illustrated by the insolubility of the haze of ammonium chloride in washing bottles and of solid sulphuric anhydride in water. The washers can only extract the naphthalene which is in the form of vapour. At 104° Fahr., this amounts to 83·47 grains per cubic foot, but at 50° Fahr. to only 14·1 grains per cubic foot. If the first chamber of a naphthalene washer has removed this vapour, the solid naphthalene in the form of dust can be converted into the same quantity of vapour, which can then likewise be removed. But as the process proceeds by stages, if we assume that the naphthalene entering the first chamber of a washer amounts to 87·4 grains per cubic foot and that at 30° C. (86° Fahr.) about 39·33 grains are in the form of vapour, this amount will be removed in this chamber at that temperature. From the remaining 48·07 grains of naphthalene dust, 39·33 grains will again be vaporized on the way to the second chamber. But if the washer is working at 18° C. (64·5° Fahr.) instead of at 30° C., only about 21·85 grains of the total of 87·4 grains of naphthalene per cubic foot are directly washed out in the first chamber, and there passes on into the second chamber 43·7 grains of naphthalene dust, and into the third chamber 21·85 grains, and so on. These considerations disclose the reason why naphthalene washers are kept warm. Not only is advantage thereby taken of the greater solubility of naphthalene in the oil at the higher temperature, but also of the higher vapour tension of the naphthalene and, consequently, of the higher proportion of naphthalene in the form of vapour.

The purification of gas is generally limited to the washing out of ammonia and the removal of sulphuretted hydrogen. In a few of the small and moderate-sized gas-works, cyanogen washers are also employed. In regard to the ammonia washers or scrubbers, most commonly these are vertical vessels, in the first of which gas is sprinkled with liquor and in the second with clean water. The efficiency of the vessels is ascertained by determining the amount of ammonia in the gas before and after each vessel; and for this determination the costly experimental meters are not used, but aspirators consisting of carboys of about 60 litres capacity, which are readily obtainable anywhere. They are set up in the room where the investigation is to be made some time beforehand, in order that the water may acquire the temperature of the room, and are weighed before and after use. The difference in the weighings (expressed in kilogrammes) gives directly the number of litres of gas aspirated; but if absolute, instead of comparative, figures are required for the proportion of ammonia in the gas, it is necessary to have a pressure gauge attached to the carboy and to bring or correct the volume of gas to atmospheric pressure. The gas is aspirated through a measured quantity of standard sulphuric acid, which for crude gas may conveniently be of normal, and for clean gas of decinormal, strength.

For the clean-water scrubbers nothing further is required in order to ascertain their efficiency; but in scrubbers in which liquor is used for sprinkling, it is necessary to take into account the strength of the liquor in order to ascertain whether it is doing the maximum amount of ammonia extraction of which it is really capable. In connection with this investigation, a simple apparatus is used for the determination of the tension of ammonia of the liquor at the temperature at which it is used. A current of clean gas or of air is sprinkled with the liquor at that temperature, and the ammonia in a measured volume of the gas thus washed with the liquor is determined by means of sulphuric acid. It is evident that the liquor, when used in the works' scrubber at the same temperature, cannot reduce the ammonia in the crude gas below the proportion found in this test; and thus the real efficiency of the scrubber may be calculated.

If the efficiency of a scrubber is found to be (say) 25 per cent. too low, the fault may be due either to insufficient liquor or water having been used, or else to the water having taken a one-sided course through the washer, either owing to the sprinkler nozzles having become blocked or to the distributing plates having become uneven, or from some similar cause. It is easy to ascertain which defect is responsible for the low efficiency, by observing the action of the scrubber about 1½ hours after the retorts have been charged, when the evolution of ammonia from the coal is at a maximum, and, again, shortly before the retorts are drawn, when the evolution of ammonia is at a minimum. If the efficiency is equally low at both times, it is almost certain that a part of the washer is not properly sprinkled, and some of the gas thereby escapes washing. If, however, the quantity of water or liquor used is insufficient, the efficiency of the washing will be greater at the time when less ammonia is entering the washer. With regard to the rotary washer-scrubbers, it is desirable to ascertain whether all the chambers are doing their proper share of the work. If it is found that practically no ammonia is entering the last chamber, the amount of water used should be reduced so that a more concentrated liquor may be obtained. Testing of the separate chambers will also disclose any unsoundness of the partitions.

The purifiers in the ordinary course need little special investigation. When cyanogen washers are not used, and the oxide purifiers are small, it is of interest to ascertain how much cyanogen is removed in each vessel and how much passes out in the clean gas. For this purpose, a volume of gas, measured by an experimental meter or an aspirator, is washed in absorption tubes containing ten bulbs, or in Drehschmidt flasks, with ferrous sulphate and a solution of caustic potash. The sludge thus obtained is taken away for analysis in the laboratory.

The representatives of the experimental works in the course of their inspection examine at least three times a day the quality of the gas as sent out from the works. The calorific power and specific gravity are determined; and if there is a photometer on the works, the illuminating power is also ascertained. The works' measuring instruments are compared with standard instruments, or else tested in an appropriate manner. If there are several gasholders at the works, it is considered important to test the quality of the gas from the different holders in order to ascertain the greatest variation which may ordinarily occur in the gas distributed. If great fluctuations are found where there is only one holder, a more prolonged investigation becomes necessary in order to ascertain the maximum and minimum values and what phase of the works' procedure is responsible for the fluctuations. Ordinarily, the course of investigation of the working of a small or moderate-sized gas-works indicated in the foregoing will entail a visit of inspection extending over two to three days.

Efficiency trials of new apparatus have been carried out by the experimental works in several instances, and have proved of considerable value. The trials serve to settle definitely whether the conditions of supply or the contractors' guarantees as to efficiency have been fulfilled. The knowledge that the apparatus or plant will be properly tested on delivery will serve to prevent unfair competition among contracting firms, some of whom might otherwise be tempted to guarantee results which the plant or the apparatus is not really capable of affording.

The conduct of investigations on various gas-works by the staff of the experimental works is beneficial to the latter in providing a substantial foundation of practical experience of works' conditions which will tend to make the instruction given at the same works, in courses of lectures, &c., for gas engineers, more valuable. As a consequence, the experimental works attaches great value in this respect to the carrying out by its staff of investigations for the control of working of gas-works and for the testing of the efficiency of plant. The most suitable time for such investigations will be when the plant is being worked nearly to its full capacity. But, on the other hand, it is usually inconvenient to the gas-works' staff to have such investigations in progress at the time of maximum make, when naturally there is much pressure of work upon them. The training of a staff for carrying out the investigations clearly is a matter of some difficulty; and the co-operation of gas-works in this direction is of great value. It is hoped, however, that the investigations already carried out will serve to justify the anticipations which attended the foundation of the Experimental and Instructional Works at Carlsruhe.

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In the discussion that ensued on the reading of Dr. K. Bunte's paper, Dr. Knublauch, of Ehrenfeld, Cologne, made some extended remarks which will be referred to next week.

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**Glover-West Vertical Retorts for the United States.**—We learn that a contract has been placed with West's Gas Improvement Company, Limited, for an installation of Glover-West vertical retorts for the Fitchburg (Mass.) Gas-Works. This is the first installation to be built on this system in the United States; and the contract has been placed as the outcome of a recent visit by Mr. Fred J. West to America. The Fitchburg Gas and Electrical Company, it may be mentioned, is one of the many similar concerns of which Mr. C. H. Tenny, of Boston and Springfield, is the President and moving spirit; and prior to the decision to introduce the Glover-West system, Mr. Tenny and Mr. H. Burgi, the Consulting Engineer to the several Companies referred to, made an exhaustive investigation into the system at Manchester and St. Helens.

# SMOKE AND ITS PREVENTION.

### Lecture by Professor Vivian B. Lewes.

At the London Institution last Thursday evening, a lecture on "Smoke and its Prevention" was delivered by Professor VIVIAN B. LEWES, F.I.C., F.C.S.

The lecturer began by characterizing the question of the best method of combating the nuisance arising from smoke as the most important one of the day, alike from the sanitary and the artistic aspect. He pointed out that when coal was first used for fuel purposes in the Thirteenth Century, the smoke to which it gave rise roused such indignation among the public that in 1306 a decree was passed forbidding its use. But, notwithstanding attempts to banish it, it became firmly established not only as a fuel for domestic consumption, but also as the great source of power. It was not until the latter half of the last century that the cumulative effect of smoke began to make itself felt; and the efforts of those who were interested in its abatement apparently had some slight influence in reducing the plague. Certainly, during the past ten years the fogs had not been of the same density or as frequent as they were in the preceding twenty or thirty years; but how far this had been due to efforts at smoke abatement and how far to meteorological conditions he was unable to say. Even if a certain amount of work had been done, so much still remained to do that the subject was as important now as ten years ago.

Turning to the cause of the cloud which hangs over our big towns, cutting off the direct rays of the sun and ruining health, the lecturer said that in the South of England it was the domestic grate, using bituminous fuel, which was responsible for the major portion of this pollution of the atmosphere; while farther north, in the great manufacturing centres, it was the factory chimney. Dr. Shaw had estimated that 70 per cent. of the smoke in London was due to domestic fires; but in Sheffield or Birmingham the figures would most likely be reversed. Domestic smoke was produced throughout the length and breadth of the land; whereas the factory concentrated its attention on the more limited area of the manufacturing districts. While improvements brought about by stoking machinery and attention to air supply had shown how smokeless factory shafts could be obtained, little had been done to improve the conditions of fuel consumption in the household. The ideas existing as to the composition and use of bituminous fuel were still very vague; and it was this side of the subject with which he desired to deal.

Professor Lewes then described in detail what takes place when bituminous coal is fed on to a burning fire; and this led to a lucid explanation of the nature and property of flame. From the facts he had brought before his audience, he said several points were clear: (1) That the smoke-forming portion of bituminous coal is the hydrocarbons which on destructive distillation form the tar. (2) That the true coal gas contains but little of these, and can easily be burnt with smokeless combustion. (3) That the residue left after the destructive distillation of the coal—*i.e.*, coke—burns without the formation of smoke. (4) That tar vapour and white smoke escape in the form of minute vesicles, which will float in air until burst by violent contact with some surface, on which they then deposit as tar. (5) That what we speak of as smoke consists of a mixture of tar vapour, water vapour, tarry carbon particles, products of combustion other than water vapour, and fine particles of ash.

Having indicated the causes which give rise to smoke from the domestic hearth, Professor Lewes reviewed the proposals which have been made from time to time for its prevention. These, he said, might be classified under the following headings: (1) The use of bituminous fuel in special grates. (2) The use of solid smokeless fuel. (3) The use of gaseous fuel. (4) The combined use of gas and coke. (5) Central heating by steam, water, or hot air.

In considering, said the lecturer, the claims of these various methods, we must remember that the English open fire is undoubtedly the most comfortable and wasteful method of heating that could be adopted. But though by far the largest proportion of the heat escapes up the chimney, we must clearly bear in mind that this makes it a most important engine of ventilation, and that at this time, when the ventilation of our middle-class houses is chiefly left to the "jerry" builder and to the open fireplace, it is an important factor of health. Moreover, it heats the room in the only healthy way—that is, the radiant heat from it does not directly raise the temperature of the air, but is radiated to the floor, walls, and furniture in the room, which, again, part with their heat slowly to the air in contact with them and to the inhabitants, so that the walls and other solid matters in the room are higher in temperature than the air. If one can retain the chief characteristic of the open fire—*i.e.*, heating by radiation—and eliminate the smoke production and excessive waste of heat up the chimney, we should have the ideal conditions for house warming.

Enormous improvements have been made in the domestic fire-grate during the last fifteen years, both from the artistic and the economic point of view; and while with the older forms it was not unusual to find a coal consumption amounting to 7 to 8 lbs. per hour, this quantity has been reduced in the more modern forms to about half. This in itself has been an important step in smoke reduction. But grates have long lives; and the capital outlay of putting in new ones results in the modern forms being chiefly found in new houses. There have been many attempts made to construct grates for the smokeless consumption of coal; but it is found in practice that when once the heavy carbonaceous smoke is produced, it is very difficult to burn again the carbon particles completely, and the dilution caused by the large volumes of nitrogen present prevents their easy combination with the oxygen of the air. There is no doubt that the best methods of preventing smoke from bituminous coal is to feed on the fresh coal only in very small quantities, and supply the top of the fire with a sharp draught of hot air. Under these conditions, complete combustion of escaping hydrocarbons is ensured, and very little carbon is allowed to be liberated in the solid form. In order to do this, however, the stove has to be to a certain extent closed in; and it is also found that no grate for bituminous coal is absolutely smokeless.

The great factor in making special forms of grate an inefficient solution of the smoke problem is that it involves large capital outlay on the part of the consumer; and my own experience is that unless consumers can become reformed without expense or extra trouble, the majority will talk but never act. It is for this reason that the use of solid smokeless fuel, which can be consumed in all existing grates, appears the most likely solution of the great question.

Smokeless fuels may be classified as: (1) Coal which has been carbonized at a high temperature, so as to drive out practically all the volatile matter. This class is represented by gas coke and "Coalexld." (2) Coal which has been partially carbonized so as to distil out the smoke-forming constituents, but to leave enough volatile matter to give a non-luminous flame and easy ignition, as seen in coalite and carbo. (3) Non-bituminous coal, such as anthracite.

Coke, the solid product of high-temperature distillation, has never found favour with the middle and upper classes as a domestic fuel, owing to prejudice against it because of its being somewhat difficult to ignite and not burning freely. Its chief market has been for steam-raising and other manufacturing purposes; very little finding its way into the householder's grate. The result is that, if carburetted water gas had not offered a convenient and economical way of using it in gas-works, many companies would have found great difficulty in keeping up the price during the years that coal was cheap. It must be remembered, however, that during the past three years the gas industry has been in a transition stage, and England is slowly following the lead of the Continent in recognizing the fact that great economies are to be found in carbonizing coal for gas making in larger charges than have ever before been attempted; and the introduction of vertical and oven retorts is undoubtedly a step in the direction of making a coke which shall be more fitted for a domestic fuel than the overheated product made in the horizontal retorts of late years.

The large amount of attention centred upon the production of a smokeless fuel during the past three years has led to the introduction of several processes for improving the coke during gas manufacture, which, though leading to little or no improvement, have enabled the product to be sold under a fancy title, and have done a certain amount of good by inducing consumers to try under another name the coke which prejudice would have condemned untried.

The second class of smokeless fuel, and the one which many scientific men look upon as the most promising solution of the smoke problem, owes its inception to Colonel Scott-Moncrieff, who many years ago suggested the use of a half-coked coal as a fuel supply, and tried to make a commercial article by carbonizing coal at the ordinary gas-retort temperature—drawing the charge when half the usual volume of gas had been distilled out from it. Two factors, however, led to failure—one being that the time was not ripe; and the second that the means by which he proposed to carry out his entirely admirable idea, being dependent upon the ordinary gas-works practice, had to be carried out under certain conditions which led to a want of uniformity in the fuel and to certain difficulties which those who tried to make it failed to overcome.

The idea, however, of a semi-carbonized coke, which should still contain enough volatile matter to give easy ignition and a cheerful flame without any smoke, was independently revived under the name of "Coalite." This differs from the fuel proposed by Colonel Scott-Moncrieff in that, instead of shortening the period of carbonization at a high temperature, the temperature is reduced to one-half the ordinary, and is continued in suitable retorts until a uniform coke, containing from 12 to 15 per cent. of volatile matter, is formed. In both processes there is the fatal defect, from a gas manufacturer's point of view, that less than half the volume of gas is obtained per ton of coal; and as the all-conquering career of the incandescent mantle has rendered gas of high candle power unnecessary, the rich gas yielded is not looked upon as an equivalent attraction. The coalite process has the advantages over the older one that the fuel is of greater uniformity, and that the yield of tar is doubled instead of being decreased, and is much enhanced in value.

Coalite has created so much interest that, as was only natural, the Moncrieff process was revived; and the product is well known under the name of "Carbo." Coalite at present appears to be labouring under difficulties; but I am as convinced now as I was when I first examined the process that, when its manufacture is properly handled, it will be the ideal fuel, and will not only solve the smoke problem in the easiest possible way, but will also be an important economic advance in our treatment of coal.

The use of a non-bituminous coal like anthracite would result in a smokeless and very hot combustion. But here again the objection is that stoves with a special draught would have to be used, and the initial cost would prevent its employment ever being adopted; besides which, any great demand for this kind of fuel would at once send up the price to a prohibitive figure. If the consumer can be induced to take the trouble, a very good smokeless fuel can be made by using a mixture of two-thirds coke to one-third coal, and, instead of piling up the grate with cold fuel when the fire burns low, adding the fresh fuel frequently in small quantities, so as to prevent the deadening of the top heat of the fire. But this is diminishing, not killing, the evil.

Leaving the smokeless solid fuels, which I believe will in the future play a big part in the cleansing of town air, we now come to the gaseous fuels; and here at once we have ready to hand a solution of the difficulty in the use of coal gas. Gas-fires, gas-cookers, gas water-heaters, gas-engines—all these have been developed to a point which leaves no valid excuse for overlooking their claims; and ever since Bunsen, in the early fifties, gave us the atmospheric burner, in which non-luminous combustion is obtained and smoke rendered impossible, coal gas has steadily progressed in favour for heat and power as well as for light, until at present nearly as much is used for the one as for the other.

What, then, stands in the way of its universal adoption? First and foremost, initial cost crops up, as, though much has been done by the companies in popularizing gas-stoves by letting them out on hire, by easy-payment systems, and by looking after their maintenance, the consumers must pay something; and this is sufficient to damp their ardour as smoke reformers. Secondly, gas is a little more expensive than coal for continuous heating, though when used for short periods, as for fires in bedrooms, &c., the fact that one can turn it on when the fire is wanted, and turn it off when it is done with, brings the fuel cost to nearly the same as coal; while in such places as Widnes and Sheffield, where the price has been reduced to a minimum for heat and power, the gas-engine and gas-fire well hold their own.

The chief sentimental objections to the gas-fire—its non-pokerability and one's not being able to throw cigar stumps and ash into it—are got over by a suggestion made first, I believe, by Sir William Siemens some thirty years ago, and that is to decompose bituminous coal into coke, tar, and gas at the gas-works, and reunite the true heat producers, coke and gas, in our fire-grates *sans* the smoke-producing tar—to do, in fact, with coal what was done by Chevreul a century ago with tallow, when he converted the tallow dip into the composite candle. All the initial outlay needed for this is to fit the atmospheric burner arrangements of the gas-stove to any ordinary fire-grate, so arranging them that they can be made to swing back clear of the fire when they have done their work of bringing to bright combustion the gas coke used as fuel in the grate. This has always seemed to me to be the best economic method of using the products of gas manufacture, because it would be impossible to employ either gas or coke alone to supplant entirely the use of bituminous coal. A market must be made for the bye-products if prices are to be kept down and, as we hope, still further reduced. But if the use of gas and coke could be increased, the gas manager could afford a diminution in the price of tar from over-production, as he has already ruined the tar market by overheating his retorts, and so loading the tar with free carbon and naphthalene as to make it nearly worthless.

As I have before pointed out, to my mind the best solution of the dual question of the most economical use of coal and the cleansing of our atmosphere is to be found in low-temperature carbonization and the production of such fuels as coalite, because every constituent of the coal is utilized in the best way. But when we see how little expense and personal trouble are needed to attain smokeless combustion in other ways, it becomes evident that the mere provision of means to bring about the desired end is entirely insufficient. How can the societies interested in smoke abatement influence the hundreds of thousands of small consumers whose chimneys produce the morning cloud? They may make their doctrines felt in the West End; but will they ever touch the seething population of the workers' quarters of all our towns?

One is gravely told that legislation should be passed dealing with the question, and that the use of bituminous coal should be forbidden. But I think this is scarcely feasible; and unless we revert to the conditions of 1306, when a citizen of London was executed for using bituminous coal, I doubt as to its being effective. I do believe, however, that if a future Chancellor of the Exchequer would put a 5s. tax on bituminous coal, exempting that used for gas making, smokeless fuel manufacture, and for use by those burning it in smoke-preventing forms of grate or furnace, the question would quickly be solved, coal economized, and smoke abolished.

**Yorkshire Junior Gas Association.**—We learn from the Hon. Secretary (Mr. E. Garsed, of Elland) that the next meeting of the Association will be held at the Leeds Institute of Science on Saturday afternoon. It will be an "informal" gathering, and discussions will be opened by Mr. Cawthra, of Halifax, on "Gas-Works Emergencies," and Mr. Halkett, of Leeds, on "The Organization of the Outside Department." The proceedings will not be reported, so the members will have an opportunity of freely relating their experiences for the general good.

## MAKING BALLOON GAS IN WATER-GAS PLANT.

At the last meeting of the American Gas Institute, Mr. GEORGE H. WARING, of Omaha, read the following paper descriptive of his method of manufacturing balloon gas in water-gas apparatus.

During the past three years, there has been a great revival of interest in the navigation of the air; while ballooning has taken its place as a recognized sport. This has resulted in an increasing demand for gas of high lifting power suitable for balloon inflation. An inquiry for such a gas was made of the writer in Omaha early in the present year; and this paper is the result of his attempt to supply it. Coal gas, when available, has been generally used for the purpose; otherwise recourse is had to the employment of chemically prepared hydrogen from small temporary plants. But this is, of course, quite expensive.

The regulations of the International Association of Aëronauts require that the coal gas shall have a lifting power of at least 43·6 lbs. and the hydrogen 65·4 lbs. per 1000 cubic feet—corresponding to specific gravities of 0·43 and 0·15 respectively. Apparently a specific gravity of about 0·33 is considered best adapted to balloon use, owing probably to the greater loss by diffusion through the fabric with lighter gases.

In the writer's case, no coal-gas plant was available, so that it was necessary to substitute a special gas made in water-gas apparatus. After considerable investigation, no promising existing methods were found, and one had to be devised. The result of this effort was the development of the process to be described.

The method consists in largely decomposing a hydrocarbon into its elements, carbon and hydrogen, in the fuel-bed of the generator of a water-gas set, and completing the reaction to any desired degree in the highly heated carburettor and superheater. This process was suggested by results obtained by the writer in some earlier work, described in a paper presented to the Western Gas Association in 1906, on the "Utilization of Tar in Water-Gas Apparatus,"* where it was found that, by the use of a small amount of tar during the down run, with steam, the percentage of hydrogen in the blue gas was increased from 50 to 60 per cent., while the specific gravity was lowered from 0·554 to 0·456. From these data it was evident that practically any desired gravity could be obtained by increasing the amount of hydrocarbon to be decomposed, and decreasing the quantity of steam used.

The final tests were made with a standard 6-feet set, 4 feet in internal diameter. The oil was introduced at the top of the generator with a spray, to secure uniform distribution over the fuel-bed. The following general conditions were found to yield successful results: The fire should be carried low, and just sufficient steam used during the blow to prevent the grate-bars from burning and keep down the clinker. The fire should be kept open by a double-length blow once an hour, and by lightly breaking up with a bar twice a day.

The first half of the run is made "down," without any steam. From 15 to 20 per cent. of the oil is admitted before closing the stack-valve, so as to purge the blast gases out of the set. The last half of the run is made "up," using sufficient steam to bring the specific gravity up to the point desired. The heats should be carried high through the whole set. A copious supply of water should be run in the wash-box to keep the lampblack washed out. A typical run gave the following results with gas coke from West Virginia coal:

| | |
|---|---|
| Total make of gas corrected | 98,000 cub. ft. |
| Make per hour | 10,900 " |
| Steam per 1000 | 18·5 lbs. |
| Oil " | 6·9 galls. |
| Coke " | 30·2 lbs. |
| Air per 1000 through fire | 2,690 cub. ft. |
| Steam during blow per 1000 of air | 70 lbs. |
| Temperature at bottom of superheater | 1,630° Fahr. |

Length of blow, 4 minutes; length of run, 6 minutes.
Depth of fire, 4 to 5 feet.
Specific gravity of gas: Max., 0·390; min., 0·330; aver., 0·350.

The two analyses given below show some of the possibilities of this process. Sample "A" was taken during the latter end of the run of which the results are given above; while sample "B" was taken during an earlier test, and shows the ease with which a very low specific gravity can be obtained if desired.

| | Sample "A." Per Cent. | Sample "B." Per Cent. |
|---|---|---|
| Illuminants | 1·0 | 0·4 |
| Carbon monoxide | 15·3 | 5·2 |
| Hydrogen | 63·7 | 75·4 |
| Methane | 11·0 | 10·4 |
| Ethane | 0·8 | 0·0 |
| Carbon dioxide | 2·6 | 1·0 |
| Oxygen | 0·5 | 0·6 |
| Nitrogen | 5·1 | 7·0 |
| Specific gravity | 0·37 | 0·25 |

It is very desirable that the illuminants should be kept as low as possible, to prevent their injurious action on the rubberized fabric. It is, therefore, possible to manufacture easily and efficiently in standard water-gas apparatus a gas of any desired specific gravity that will be entirely suitable for balloon inflation, and will very closely resemble in its composition a low grade of coal gas. The commercial aspects of the process will, of course, be dependent upon the possible local demand; but in time of war it

* See "JOURNAL," Vol. XCV., p. 35.

might prove of considerable value. From the foregoing analyses, however, it will be seen that a gas suitable for balloon use would be one of very poor quality for public distribution.

## SCOTTISH JUNIORS AT BONNYBRIDGE.

On Saturday afternoon, the members of the Eastern District of the Scottish Junior Gas Association, to the number of about thirty, paid a visit to the Bonnyside Fire-Brick Works at Bonnybridge, belonging to Messrs. James Dougall and Sons, Limited. They were received by Mr. R. Dougall, the Vice-Chairman of the Company, and Mr. E. M. Stewart, the Managing-Director.

After the company had been photographed, they were shown over the works, seeing the processes of grinding the blocks of clay to powder, moistening it, moulding, floor-drying, and afterwards kiln-drying. It is a necessity, on account of the want of cohesion of the particles of which fire-clay is composed, that at all times the drying of the moulded pieces shall be under cover. A shower of rain would reduce unfired goods to mud. At Bonnyside, there is an immense floor-space roofed over; the floor being composed of concrete, with piping contained in it, through which waste steam, augmented as required by live steam, is passed to provide heat for driving off the moisture from the newly-made bricks which are laid on it. After lying for a day or two on the floor—the length of time being regulated by the sizes of the pieces—the goods are built into the kilns and fired. Of the kilns there are two sorts in use—the old-fashioned conical kiln heated by coal-fires direct, and a range of patent kilns heated by producer gas. The direct-fired kilns take about five days to fire, and the gas-heated kilns longer; the explanation of the longer time in the latter case being that the preliminary heating, to drive off the added moisture in the goods, is accomplished by the waste heat from the ovens which are under full heat, so that an oven may be under heat for several days before the direct gas heat is turned on to it. The gas is producer gas, made on the spot, from coal which is obtained in the neighbourhood. The gas is consumed uncondensed and unpurified, and there are no residuals—the coal being gasified, and the coke at a lower level in the vertical chamber, gasification being there assisted by the introduction of steam. The shapes into which fire-clay goods are made are innumerable. The visitors saw a great many of these; they also saw a retort being made. After inspecting the works, they were taken down the Russell pit, which is nearly 100 feet in depth; and though itself quite new, and the workings from it not extensive, these communicate with the older workings. The visitors were conducted through them to the working-face, where the method of getting the clay was shown—two shots being fired in their presence to loosen the material.

On returning to the surface, the company sat down to a substantial meat tea, in the mission hall attached to the works. Mr. R. Dougall presided, and extended a cordial welcome to the Association. After tea, Mr. E. M. Stewart, the Managing Director of the Company, read a paper on "Fire-Bricks," some extracts from which, together with a report of the discussion to which it gave rise, will be published in a subsequent issue.

The President (Mr. Walter Dunlop, of Kirkcaldy) proposed a hearty vote of thanks to Mr. Dougall for presiding. They had, he said, spent a very pleasant afternoon, and one which had been an education to them all.

The Chairman, in returning thanks, said he had taken great interest in the proceedings.

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According to M. Mirande, writing in the "Comptes Rendus," it has been found experimentally that the vapours given off by tar such as is used for treating roads act injuriously on green plants. In the open country, these vapours would be insufficient to act detrimentally upon vegetation; but it is considered that in shut-in streets damage to trees planted on the edge of the pavement may be expected.

Before the Manchester Students' Section of the Institution of Civil Engineers, Mr. H. J. F. Gourley read a paper on "Concrete and Reinforced Concrete Piles." He said that to obtain wooden piles of standard quality had been increasingly difficult of late years; and it was necessary, therefore, to find materials which were at least as strong and economical as wood. The use of concrete, and recently of reinforced concrete, had become more extended and varied as the knowledge of their properties had increased; and it seemed quite natural that the question of their suitability for piling should have engaged the attention of engineers anxious to find an efficient substitute for wood. Apart from the difficulty of obtaining timber piles of uniform quality, wooden piles might also be defective, though apparently sound, judging by their external appearance. With thorough supervision and the use of properly graded materials, there should not be any difficulty in securing perfect uniformity and soundness in concrete and reinforced concrete piles. The load placed upon an average wooden pile might be taken at 15 tons; but on concrete piles it was 40 tons or more. The wooden pile, again, must always be wet. If this condition obtained, the life of the pile was long; but should the pile be subjected to the partially wet and partially dry state, deterioration soon set in, and its life was short. There was no such risk where concrete piles were used.

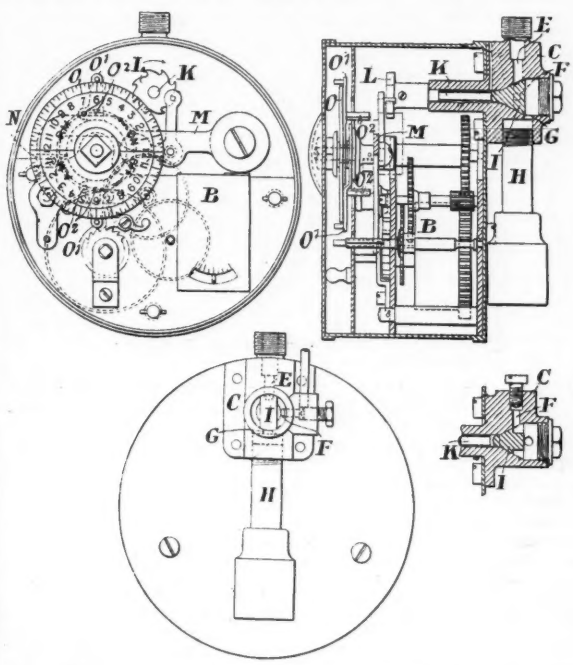
# REGISTER OF PATENTS.

### Gas-Controllers.

HUME, G. W., of Hyde Park Mansions, W.

No. 25,142; Nov. 1, 1909.

This invention provides a device to be actuated either by clockwork or by fluctuations of the pressure in the mains for lighting or extinguishing a number of gas-burners used in street illumination. In it, a valve controls main and bye-pass passages, and is arranged so that as it rotates one passage is uncovered before the other passage is covered—the openings to the burner and the bye-pass being exposed by the removal of a cover on the casing of the valve.




Hume's Gas Lighter and Extinguisher for Public Lamps.

The illustration shows a front elevation of the controller of the clockwork type, with the cover removed; also a sectional side view and a rear elevation with a portion removed to expose the valve.

B is the clockwork mechanism for controlling the turning on and off of the burners. C is the casing of a valve with a conical seat and with a passage or way E, which extends from it, in communication with the burner-tube (not shown). F is the passage in communication with the bye-pass tube, and G the passage in communication with the gas supply tube H. In continuation of the conical seating of the valve there is a cylindrical recess in the casing C, which is normally closed by a screw-cap, by removing which the passages E F G are exposed to allow of accumulations of naphthalene or other deposits being cleared away.

I is a conical valve which fits into the valve seat. The upper portion of the valve is formed with two lateral recesses, and the valve is mounted on the spindle K, which extends into the casing of the apparatus; its inner end having keyed to it a ratchet-wheel L, with the teeth of which there engages a pawl pivoted upon the weighted lever M, provided near its pivot with the tappet N. In conjunction with the tappet is arranged the disc O, which is rotated by the clockwork mechanism B, and has adjustably mounted upon it arms $O^1$ carrying pins $O^2$, which consequently rotate with the disc and intermittently actuate the tappet on the lever M so as to operate the pawl and turn the ratchet-wheel L to operate the valve I.

Assuming the parts to be in the position shown—with the passage E to the burner closed and the passage F to the bye-pass open—when the spindle is partly rotated by one of the pins $O^2$ under the action of the clockwork (that is to say, at any predetermined time for which the arms $O^1$ have been set), the conical valve I is moved. This movement, due to the first pin $O^2$, uncovers the burner passage E so as to permit gas to flow to the burner-tube; the gas on issuing being ignited by the bye-pass flame to which the gas is not yet cut off. The second pin $O^2$ on the same arm $O^1$ then actuates the tappet N and further rotates the valve I; this further movement closing the bye-pass passage F, but leaving the gas passage E still uncovered. At the expiration of a predetermined period of time, the pins on the other arm $O^1$ come into operation; the first of the pins further turning the valve I so as to first open the bye-pass passage F, and the second pin then closes the burner passage, thus leaving the bye-pass flame burning until the time arrives for the gas to be again ignited.

### Atmospheric Gas-Burners.

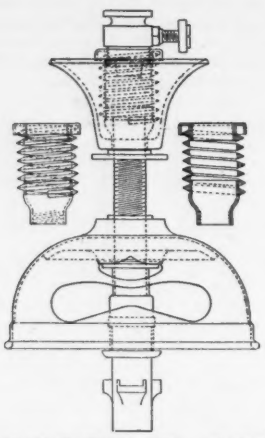
NEWHOUSE, W. A., and FITMENTS LIMITED, of Bradford.

No. 25,187; Nov. 2, 1909.

This invention has reference to the construction of atmospheric gas-burners of the type in which the rigidity of the mixing-tubes is broken by concentrically interposing a double or compound spiral spring. It

is a further application of the principles covered by patents Nos. 6700, 9740, and 15,507 of 1909.

The patentees say they depart from existing general practice in the construction of the mixing or bunsen tube in their means of making the compound gas and air mixture, by arranging for the passage of the air through a series of concentric spiral angular faced openings through which air is indrawn by the suction action of the gas passing down the tube. Simple means are also provided of controlling the air supply, and otherwise accommodating the capacity of the burner to varying conditions.



Newhouse's Anti-Vibrator Atmospheric Burner.

The invention consists (as shown) in combining with arrangements disclosed in the other patents named a compound spring of special construction composed of two springs interwound one upon or one within the other, but preferably provided with a series of concentric spiral angular faced openings upon which a similarly constructed spring formed in the obverse way works for varying the distance between the two parts of the divided tubes, and for controlling the volume of air admitted to the bunsen mixing-tube—the junction piece forming with the gas-bracket an integral part of the tube body and the primary air inlet to the gas. The action thus obtained is similar to the pendulous swing of flexible tubing—"the mantle moves as a solid unit with the whole mass of the burner when disturbed from rest by shock or vibrations." The chief merit of the arrangement of the bunsen aperture is said to be that the mixing area for the production of the mixture of air and gas can be amplified to a much greater extent to ensure complete combustion than is usual; also by mounting the bunsen tube in the way described supplementary means for varying the capacity of the burner are available when it is desired to use an extremely sensitive anti-vibratory medium in mills, by allowing the burner-tube to extend upwards inside the bunsen, so as to make the mixing area proportionate to the standard already ascertained for satisfactory results under normal conditions with a spring of average length. By this means, a much longer spring may be used with or without the air controlling supplementary spring.

## Coin-Freed Gas-Meter Lock.

GARDNER, F., and EMMONS, F. J., of Southend-on-Sea.

No. 25,496; Nov. 30, 1909.

This invention has for its object to provide a lock so constructed that when it is placed in position with the fixed staple or eye in the slot in the body or casing of the lock, the latter becomes substantially a fixture on the receptacle to which the lock is applied; so that it is practically impossible to prise it off. To this end the body or casing of the lock is provided with a projection adapted to engage or interlock with the receptacle to which it is applied—for instance, the projection may be in the form of a hook adapted to be engaged with the material of which the receptacle is made.

## Gas-Meters.

HIBBERD, C. E., of Victoria Street, S.W.

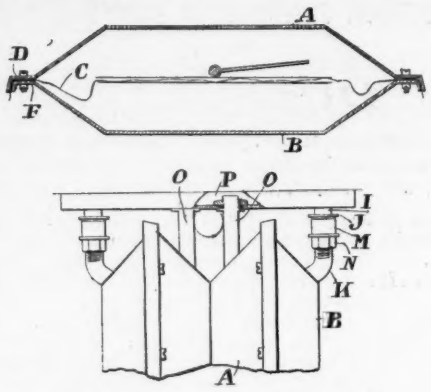
No. 26,425; Nov. 15, 1909.

This invention relates to gas-meter measuring chambers, and more particularly to means for ensuring accessibility to the working parts.

The illustration shows in plan section a form of the measuring chamber referred to, and below two such chambers assembled together—their connections to the meter ducts being also indicated.

The measuring chamber comprises a fixed wall A, which is the inner wall, and a detachable wall B, which is the outer wall. Between these walls the diaphragm C moves; the gas being admitted to, or expelled from, opposite sides in proper sequence. The wall A is formed at its periphery with a flattened edge D (with a flange extending around it), to which is fixed the edge of the diaphragm. The wall B is formed at its periphery with a circular flat edge F and flange. This detachable wall is merely pressed upon the fixed wall; the two flanges co-acting to produce a gas-tight fit, with the diaphragm acting as a washer.

In measuring chambers of this type, it is necessary to provide for the ready connection and disconnection of the gas-duct; and this may be done (in a manner in which every possibility of leak is avoided) by forming the gas-pipe I leading to the measuring chamber with a screw thread at its extremity, and a collar or the like J upon it. This is then positioned to co-act with a gas-pipe K provided upon the detachable wall B, and also screw threaded. When it is desired to connect the two pipes, the lock nut N is first screwed on to the pipe K; the sleeve M is also screwed upon the pipe, the wall B is placed into position, a washer is placed around the threaded part of the pipe I, bearing the collar J, and against the latter the sleeve M is screwed into position to bear firmly against it; the lock nut N being brought into position to retain the whole in place.




Hibberd's Gas-Meter Measuring Chamber.

The fixed wall A of the measuring chamber is provided with a duct O, which passes into the gas-channels P beneath the valve gallery of the meter. This pipe is connected to the duct by a flange upon it, which is brought firmly to bear upon the wall of the duct P by a nut co-acting with a screw thread formed upon its upper extremity.

## Treating Gases from Gas-Retorts or Coke-Ovens.

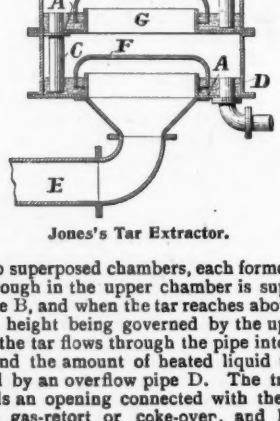
JONES, A. O., of Whitley Bay.

No. 26,428; Nov. 15, 1909.

In treating gases obtained from coke-ovens and gas-retorts for the extraction of the tar, ammonia water, and other products, it is usual to pass the gases through (say) a condenser, and afterwards through a series of air-cooled chambers, to cause the deposition of the tar; and the gases passing therefrom, and still containing some tar and ammoniacal vapour, are then passed through a Pelouze extractor, which may consist of a series of superposed plates having perforations.

Now the object of the present invention is to extract the tar from the gases in such a way as to facilitate the subsequent extraction of the ammonia. To carry out this object, the gas is conducted through a body of liquid tar which is at a similar temperature to the gas—namely, about 110° C.; and through this tar the gas is caused to bubble as has been previously proposed. The gases at this temperature, after having been passed through the heated liquid tar, will be found to be free from all the tar, or substantially all the tar, originally contained in them, while at the same time the water vapour in the passing gas will not have been condensed, and the lighter hydrocarbons will be deposited with the tar in the bubbling apparatus. If the temperature was greater than about 110° C., the lighter hydrocarbons would have been vaporized; and, on the other hand, if the temperature was less, the water vapour would condense. Thus at this temperature the tar from the gas is collected and added to the tar in the bubbling apparatus, and the gas passes over at the same temperature with the water vapour uncondensed, and is then admitted directly to the sulphuric acid solution in a saturator, where the ammonia is taken up. The solution in the saturator is also maintained above the boiling point of water; and, consequently, the water vapour contained in the gas still passes along with the gas from the saturator.

The invention is not limited to any specific form of apparatus by which the gas may be caused to pass or bubble through the tar; but a suitable form of such apparatus is shown.




Jones's Tar Extractor.

It consists of two superposed chambers, each formed with an annular trough A. The trough in the upper chamber is supplied with heated liquid tar by a pipe B, and when the tar reaches above a certain height in the trough (the height being governed by the upwardly projecting end of a pipe C), the tar flows through the pipe into the trough in the lower chamber; and the amount of heated liquid tar retained in this trough is governed by an overflow pipe D. The trough in the lower chamber surrounds an opening connected with the gas inlet pipe E, leading from the gas-retort or coke-oven, and located above the opening is a hood or bell F, the depending edge or flange of which is

immersed in the liquid tar in the trough. A similar hood or bell is arranged above an opening C in the upper chamber, and connected to the upper wall of the chamber is the gas outlet pipe H.

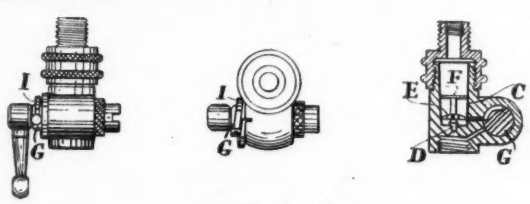
The gases are forced through the inlet pipe E to under the hood or bell F in the lower chamber. By this hood the gases are directed into the liquid tar in the lower trough, through which tar they bubble and pass into the lower chamber. They then pass from the lower chamber into the hood in the upper chamber, and are similarly directed by the hood through the tar in the trough in the upper chamber, and eventually leave the apparatus by the outlet pipe H; all the tar having been extracted by passing the gas through the body of heated liquid tar.

## Gas-Tap.

LUCKWILL, E., of Cardiff.

No. 26,991; Nov. 20, 1909.

This invention relates to taps and valves for gas of the kind wherein when the valve is opened by external means the pressure of the gas serves to keep it open until the pressure falls, whereupon the valve closes again, and closes the gas aperture against leakage or escape until the valve is again operated. The invention comprises a gravity plug disposed directly in the gas-passage, to which is connected a disc or plate, adapted to rise and fall within a conical chamber, and a bye-pass device, whereby the gas may be led above the plug to effect the initial raising of the plug from its seat.




**Luckwill's Gas-Tap.**

Within the body part of the plug is formed (as shown) a tapered or conical chamber C, the lower part of which has a seating for the conical valve D, which is provided with an upwardly extended stem terminating in a disc F; the stem being provided with a perforated guide E. G is a controlling bye-pass cock disposed transversely of the body part and formed with a bye-pass channel adapted to establish communication between the gas supply and the chamber C by ports. The plug (which is provided with a handle) may be returned to the closed position by a spring such as I.

In operation, when it is desired to open the gas supply, the plug G is turned until the ports connect, whereupon the gas impinges on the underside of the disc F, which rises and lifts the plug D from its seat —the gas issuing through the valve-seating through and around the perforated guide E, and past the disc. As soon as the valve has been lifted from its seat, the bye-pass is closed, either by hand or by the spring I; the valve being kept up and free of its seat by the flow of gas. Upon the gas being shut off at the meter, the plug falls and seals the chamber.

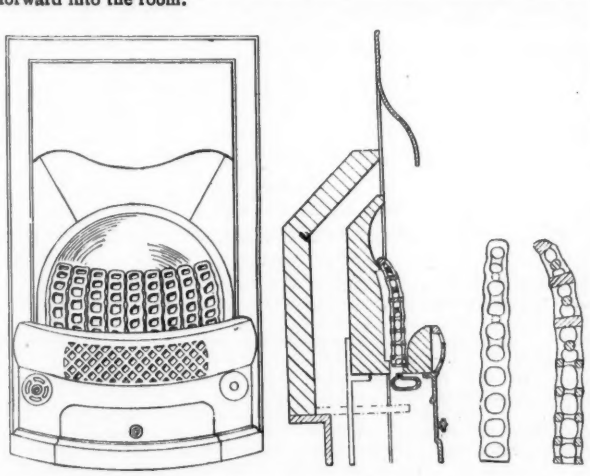
## Gas-Fires.

VALENTINE, H. S., of Stirling.

No. 28,390; Dec. 6, 1909.

The object of this invention is to produce a gas-fire which could be readily adapted to existing coal-fire grates; the chief feature of it consisting in the formation and combination of the fire brick or bricks which enclose the flame and artificial fuel.

Across or around the front of the flame bed, a brick (or bricks) of fire-clay or other suitable material is (or are) placed, as shown, so that the heat shall be radiated therefrom backward against the back brick, which, in turn, radiates the heat, along with the heat it directly receives, forward into the room.



**Valentine's Gas-Fire.**

The illustration shows an embodiment of the improvements in a gas-fire for use in an existing coal-grate—a front elevation of an ordinary grate with the front bars removed and with a gas-fire of the kind patented fitted into the fireplace; a side sectional elevation of same; and a front elevation of a single piece of the fuel for use with the fire.

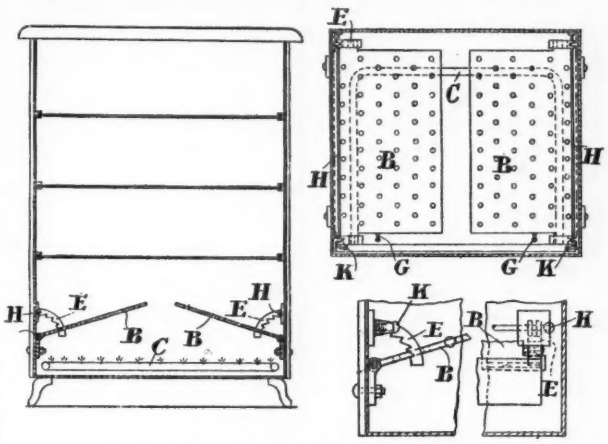
## Stoves and Ranges Heated by Gas.

WILLS, C. E., of Southport.

No. 2675; Feb. 3, 1910.

This invention has for its object to provide means whereby the heat from the gas jets or burners of stoves, &c., can be directed, as desired, to any part of the joint being cooked or heated.

The interior of the stove is fitted with one or more adjustable deflectors so arranged that the heat can be directed on to the object being cooked or heated at the part or parts desired.




**Wills's Heat Adjusters for Gas Cooking Stoves.**

As shown, the oven is provided with two deflectors or vanes B, arranged opposite one another and in proximity to the gas-jets C; the deflectors being hinged so as to be capable of moving through the arc of a circle, while the deflectors are adjustably supported in an inclined position by notched or toothed quadrants E arranged at one or both ends of the deflectors. To enable the inclination of the deflectors to be readily adjusted, each deflector has a projecting knob G. The quadrants are preferably ratchet-toothed, so as to enable the deflectors to be raised and then automatically retained in position. Each pair of quadrants is preferably connected together so as to be capable of operation simultaneously by a transverse rod H terminating at the front in an actuating knob or handle K. The deflectors are preferably perforated so as to enable part of the heat from the gas-jets to pass through the deflectors and to be distributed above them.

The arrangement is such that if, for instance, a joint of meat is to be roasted, the deflectors can be manipulated so as to direct the heat from the gas-jets to precisely such part of the joint as may be desired. The invention also "enables practically all the heat to be effectively utilized for cooking the meat, and consequently less gas is required than at present and waste is avoided."

## Clockwork Movements for Recording Instruments.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ, of Paris.

No. 7335; March 23, 1910. Date claimed under International Convention, July 9, 1909.

In the frequently occurring case in which a clockwork movement is required to do a varying amount of work while at the same time preserving a uniform speed (as, for example, in unwinding paper in recording instruments, engaging or disengaging mechanical parts at determined intervals of time and so forth), it is desirable, the patentees point out, to maintain a constant power or force on the pendulum or circular escapement. The means proposed for this purpose have usually been the power of a barrel spring or other motor device transmitted to the escapement through a train of wheels, one of which is loose on its spindle and is rotated thereby through the medium of a spiral spring attached to the spindle and loose wheel. The spiral spring, when it acquires sufficient tension, effects a stoppage of the spindle on which it is mounted, and thereby causes the barrel or motor device to be stopped when the power transmitted by the latter is too great. On the other hand, it effects the release of the barrel or motor device when the power transmitted becomes too small. The object of the invention is "to provide efficient apparatus for the purpose in question."

With this object, the patentees employ a sleeve adapted to move axially along a helical surface under the action of the spiral spring attached to the spindle and loose wheels, and against the action of a spring tending to oppose the movement. This axial movement of the sleeve has for effect to lock or stop a wheel which, through gearing, participates in the movement of the spindle that serves to wind up the spiral spring. The invention also comprises the combination with a clockwork movement of the character described and wound up automatically by an electro motor, of a brake adapted to stop the winding motor when the spring of the barrel has been wound to a given extent, and to release the motor when the movement has run to a given extent.

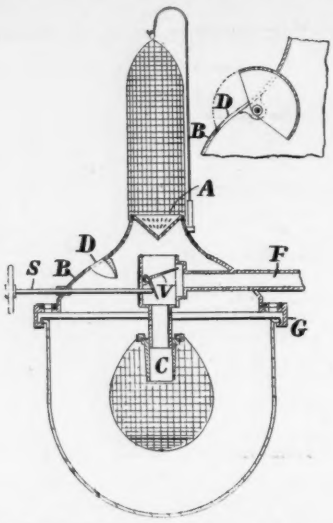
## Incandescent Gas-Lamps.

NICHOLLS, F. J., of Wandsworth, S.W., and FLETCHER, E. J., of Upper Clapton, N.E.

No. 3289; Feb. 10, 1910.

This invention relates to incandescent gas-lamps constructed on the principle of Boughton's patent, No. 13,754 of 1908, with the objects: (1) To so construct the conductor or part leading to the body of vertical

burner that, where a closed bottom chimney or globe is used to surround the lower inverted mantle, a portion of the products of combustion from the inverted mantle and burner may be permitted to escape or be conducted to the outer atmosphere, and also, where desired, to so arrange such means of escape that the amount may be adjusted or the escape may be entirely cut off. (2) To apply a device to the combined up-and-down vertical extension of the mixer that the flow of bunsen mixture simultaneously flowing upwards and downwards may be regulated and adjusted for the purpose of balancing such flow, in order that the two mantles may be equally filled with the required flame.




Nicholls and Fletcher's Double-Mantle Burner.

A sectional elevation is given of the incandescent gas-lamp mentioned above, with the improvements applied thereto.

F is the mixer, with a vertical upward extension leading to the body of the vertical burner A; and a downward extension leading to the inverted burner C. A horizontal perforated flange is arranged round the outer circumference or lower rim of the conductor B, and a gallery G extends therefrom to carry the bottom globe or chimney. On to the perforated flange is fitted a perforated flat ring, which is free to be moved round so that the holes in it may partly or entirely close the holes in the perforated flange, and thus regulate the amount of air entering the globe or chimney at the top.

Openings D are made in the conductor B, and each opening may either have a fixed inward extending cowl or baffle, or the baffle or cowl may be pivoted, whereby it may be moved so as to extend either entirely inwards or partly inward and partly outward so as to partly cover the opening D or else fully cover and close them.

The bunsen mixture, flowing along the conducting pipe F into the upward and downward vertical extensions, is regulated by means of a pivoted flap valve V, having a heel which bears freely against the inner end of a horizontal screw S, by which the flap is tilted upwards, thereby restricting the flow of bunsen mixture to the vertical burner and permitting more to flow to the inverted one, and *vice versâ*. In this way, the flow of the mixture upwards and downwards may be regulated, and the supply to the respective burners can be balanced so as to fill both mantles entirely with the flame required.

## Removing Tar from Coal Gases.

BROUGHAM, F. J.; a communication from SOLVAY ET CIE., of Brussels. No. 7915; April 1, 1910.

For the purpose of avoiding the production of ammoniacal waters which have to be distilled for removing the ammonia they contain, the patentees point out, it has already been proposed to deliver the gases produced by the distillation of coal in coke-ovens and gas-works direct to an acid solution; the passage of the gases through the acid solution producing the saturation of the ammonia—that is to say, the latter combines with the acid to form a salt. In order that this saturation may be successfully effected, a preliminary separation of the tar contained in the gases is required; and this separation has hitherto been effected while accompanied by a cooling process; so that it was necessarily attended by condensation of water. It has been proposed to recover the tar at temperatures at which the water does not condense; and it has also more particularly been proposed to use liquid tar itself as a liquid serving to recover the tar in suspension in the gas. All these various proposals are said to be "published in prior publications and belong to the domain of common knowledge."

The present invention consists of apparatus suitable for carrying out the operation of removing the tar in the presence of heat. It comprises a bubbling column or gas-scrubber made in sections, of the kind usually employed for washing gases and provided with an inlet and outlet for each section or series of sections for the washing liquid (which in this case is tar), and a surface heat regulator adapted to suitably regulate the temperature of the gas at the inlet of the scrubber, and a surface heat regulator for controlling the temperature of the tar supplied to the scrubber. This arrangement of apparatus is essential for correcting the variations of temperature resulting from the distillation of coal; and as the proper working of the entire apparatus necessitates the whole of the water remaining in the state of vapour, but without being uselessly superheated, it is necessary that means should be provided for raising or lowering the temperature of the gases and tar at will.

The illustration given in the specification is the same as that which accompanied the description of the apparatus given in the "JOURNAL" for Nov. 1 last, p. 324, and no further description is necessary.

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

## The Coalite Fiasco—Position at Plymouth.

SIR,—After reading in a recent issue the short article touching on points with which Sir William Preece may deal at the forthcoming general meeting of the British Coalite Company, I see that you are very imperfectly informed as to what has gone on at the Plymouth Gas-Works. The coalite batteries there have been pulled down and reinstated three or four times—in fact, two cargoes of scrap-iron from wrecked batteries have been sent round from Plymouth to Barking, to be followed during the last few months by several cargoes of coalite, unsaleable at Plymouth. This latter stuff was three parts breeze when unloaded at Barking.

The British Coalite Company have built a large coal-store inside the Plymouth Gas-Works. They have also installed expensive electrical plant there, besides a regular "underground railway" for their various conveyors; also apparatus for cleaning their gas, and tanks for storing their tar. Their total expenditure at Plymouth cannot have been far short of £50,000. In return for this, all the British Coalite Company will receive by-and-by will be a few hundred pounds for scrap-iron, as they did in the case of Hythe. The manufacture of coalite at Plymouth was stopped at the beginning of November.

Of course, the old story is being put about that a fresh discovery, or fresh process, for making coalite is on the verge of being proved to be a commercial success. The Plymouth gas authorities have again given extra time for the Coalite Company to set their house in order, and so the farce will go on for another few months.

*London, Nov.* 30, 1910. A SUBSCRIBER.

## Use of Calcium Chloride on Roads.

In the course of the paper read by Mr. L. A. Legros, at a recent meeting of the Institution of Mechanical Engineers, on "The Development of Road Locomotion in Recent Years," he referred, as mentioned in the "JOURNAL" last week, to the treatment of road surfaces with the view of binding the dust, and stated that one of the suggestions in this connection which had been abandoned was the use of calcium chloride. We learn from the Sales Manager of Messrs. Brunner, Mond, and Co., Limited, that this is by no means the case, inasmuch as the firm have for some years been selling the material named in increasing quantities for the purpose indicated, and their deliveries "amount to thousands of tons per annum." He states that had the rainfall last summer not been so heavy, the deliveries would doubtless have been considerably larger, "as the public bodies who have employed the material have expressed themselves as thoroughly satisfied with it in freeing the roads from dust."

## The Supply of Cheap Gas in Manchester.

In the last number of the "JOURNAL," a report was given of a deputation to the Gas Committee of the Manchester Corporation on the subject of the mitigation of the smoke nuisance by the extended use of cheap gaseous fuel. One of the speakers, it may be remembered, remarked that by reducing the price of gas an apparent sacrifice might have to be made by the Corporation; but he believed that for every £1000 of loss the City would gain tens of thousands of pounds in the way of added health to the community. A correspondent who is in business in Manchester writes on this point as follows: "I personally do not think there would be any sacrifice ultimately, seeing that a reduction made in the price of gas for power and heating only would give such an impetus to its use for these purposes as would more than recoup the Corporation for the preliminary loss occasioned by such reduction. It would be a case of a small loss on the comparatively small amount of gas now used, as against a very greatly enhanced profit through the increased sales, though the margin would be less than (say) on lighting gas."

# LEGAL INTELLIGENCE.

## GAS-METER RENT CHARGES.

### A Test Case at Salford to Go to Appeal.

At a sitting of the Salford Police Court on Friday, a case was heard which raised the question of the right of the Corporation to charge rents for gas-meters. Mr. James W. Cooke, Chairman of the Salford Ratepayers' Association, was summoned by the Corporation for the non-payment of his gas account for the quarter ending Sept. 30 last; the sum being 10s. Mr. Cooke had offered to pay for the gas consumed—namely, 8s. 6d.—but declined to pay the 1s. 6d. charged for meter-rent. The case was understood to be a test one; and a large number of interested people were present in Court.

Mr. L. C. EVANS, the Town Clerk, appeared for the Corporation; and Dr. ATKINSON represented the defendant.

Mr. EVANS, in opening the case, explained that in June last the Corporation decided by resolution to impose a rent for gas-meters supplied by them; and the question was whether the Corporation had the right to charge such rents. He submitted that, under the provisions of the Salford Improvement Act, the Corporation had such power, and the defendant was bound by the regulations as to the supply of gas.

Dr. ATKINSON argued that the Corporation had no power to charge for meter-hire. When his client decided to take gas, the agreement contained no mention of meter-hire; and he was only bound to pay the price charged for gas consumed. He agreed that the Corporation

had power to vary the price charged for gas; but they could not impose other charges, as in this case. The bill sent to Mr. Cooke was for gas supplied from July 1, whereas it was not until July 7 that the resolution of the Corporation to charge meter-rents was confirmed. This gave a consumer no chance of defending his rights. Even if the Corporation were entitled to make the charge, they could not do so until they had notified consumers of such intention. He reminded the Magistrates that the Council had decided to abolish the meter-rent charges as from the end of the September quarter.

After consultation in private, the Magistrates came to the conclusion that the defendant had put himself under obligation to pay any charge the Corporation might fix for the meter, and defendant remained liable until he gave notice of his intention to discontinue the use of the meter. They further held, however, that, before the Corporation could impose or alter a charge for the meter, as distinguished from gas, they must give notice to the consumer; thus affording him an opportunity, if he desired, of ending the agreement. Under the circumstance, they only ordered defendant to pay 8s. 6d., the amount of the charge, for gas consumed, the item of 1s. 6d. for meter-rent to be remitted. They further directed that each side must pay its own costs. The Bench agreed to state a case.

## AUTOMATIC LIGHTING—BREACH OF AN AGREEMENT.

### HIGH COURT OF JUSTICE—CHANCERY DIVISION.

**Tuesday, Dec. 6.**

(*Before Mr. Justice* SWINFEN EADY)

**British, Foreign, and Colonial Automatic Light-Controlling Company v. Hutchings.**

This was an action to obtain an injunction and damages for breach of an agreement.

Mr. PATTERSON appeared for plaintiffs; defendant did not appear.

Mr. PATTERSON said the Company was incorporated in 1905; their principal business being to manufacture and supply clockwork apparatus for automatically lighting and extinguishing gas and electric lamps. The defendant, William Ernest Hutchings, was a former employee of the Company; and the action was brought to restrain him from committing a breach of the agreement he made with them. There was a motion for an interim injunction, on which Mr. Owen Thompson appeared for the defendant; but he (Counsel) had ascertained that he was not now instructed. The defendant left the plaintiffs' service in November, 1908, and the two years during which the covenant in question was to run had expired; so that the only relief he asked was damages for the breach and the costs of the action. The clockwork apparatus was the invention of Mr. Gunning, who made and sold it; and in 1904 he employed the defendant as a traveller. In 1905, the Company was formed and took over the business, and the defendant continued to work for them as he had done for Mr. Gunning; there being at that time no written agreement with them. On Jan. 24, 1907, the agreement set out in the statement of claim was entered into; and it was modified in an immaterial respect the following October. The second clause provided that the defendant should not, without written consent, be directly or indirectly interested in, or concerned with the manufacture or sale, or solicit or take orders on behalf of, any other person or company for any automatic apparatus for lighting or extinguishing lamps. This provision was to continue in full force for two years after the expiration of the service, so as to restrain the employee from acting in the way described in any town or district in the United Kingdom in which the local authority or the gas company were or had been customers of the Company prior to the determination of the agreement. Under another clause, notice was given to the defendant in August, 1908, which expired on Nov. 21; and almost immediately afterwards he joined the firm of Alder and Mackay, of Edinburgh, who had a rival system of automatic lighting and extinguishing lamps by means of pressure instead of clockwork. Among the customers of the plaintiff Company were the Corporations of Darlington and Bournemouth and the Barnard Castle Gas Company, with whom they had contracts; also the Gas Companies at Newcastle-on-Tyne and Windsor. When the defendant left their service the Company were managing the street lighting at Barnard Castle; but some time in 1909 the District Council took it over. The defendant stated himself that he had displaced the clockwork controllers at Barnard Castle; and he said practically the same thing with regard to Newcastle, Darlington, and Windsor. At the end of 1908 or the beginning of 1909, he approached the members of the Lighting Committee of the Bournemouth Corporation, asking them to give Messrs. Alder and Mackay's system a trial; but as they had a contract with plaintiffs then running, nothing was done. At the end of 1909, however, he repeated his application; and the letters would be produced.

His LORDSHIP said one case of breach should be proved—it did not matter which one was taken.

Evidence having been given,

Justice SWINFEN EADY said the plaintiffs had proved a breach of the agreement, and were entitled to judgment, and therefore to the costs of the action. They were also entitled to unliquidated damages. As to this there would be an inquiry, the costs of which would be reserved.

## Action to Recover the Cost of Pumping Plant.

The Petersfield Rural District Council have had judgment given against them in the High Court of Justice, at the instance of Messrs. Thomas and Son, who sued for £65, the price of a steel windmill, pump, and accessories, together with the cost of erection. The defendants had paid £40 into Court, and counterclaimed for alleged damages by the loss of customers at Liss through the machinery not being of sufficient power to pump the water into a reservoir. The reservoir was to hold 30,000 gallons of water, which was to have been pumped 960 yards from the source. Judgment was given for plaintiffs on the claim and counterclaim, with costs on the High Court scale.

# MISCELLANEOUS NEWS.

## CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of the Proprietors of this Company was held last Tuesday, at the London Offices, No. 7, Drapers' Gardens, Throgmorton Street, E.C.—Mr. J. H. BIRCHENOUGH, C.M.G., in the chair.

The SECRETARY (Mr. William Martin) read the notice calling the meeting; and the Directors' report (see *ante*, p. 584) and the accounts were taken as read.

### DIRECTORIAL CHANGES.

The CHAIRMAN said it was his duty to move the adoption of the report and accounts for the past year. Since the Directors last met the proprietors, they had had to deplore the death of a colleague, Mr. F. Tendron. He was well known to all; for he had been connected with the Company for 37 years, and had served as a Director for 22 years. He had greatly endeared himself to them all by his amiable and kindly qualities. His devotion to the Company was only equalled by his confidence in its future. He (the Chairman) was sure the proprietors shared the regret of the Board at the loss of a colleague of such tried loyalty. The Directors had elected in his place Colonel Le Roy-Lewis, who was already honourably associated with other important gas undertakings. He (the Chairman) was satisfied the Company were most fortunate in securing so strong and able a Director at a time when there were many difficult problems to solve. And, if he might say so in Colonel Le Roy-Lewis's presence, his colleagues were confident that they could not have made a wiser choice. He hoped the stockholders would unanimously ratify their action.

### INCREASED SALES—THE FLOODS NEAR PARIS.

Before dealing with the affairs of their own Company, he would like to say a few words about the Union des Gaz. It would have been noticed in the report that, in spite of the strike at the Italian stations of the Company, and of the abnormal and disastrous floods which affected two of its French stations, the total gas sales of the year increased by 1¾ per cent., which proved that, even under adverse circumstances, there was a healthy elasticity about the business, which was very encouraging for the future. It would be within the recollection of the proprietors how severe the floods were in the neighbourhood of Paris last winter. The Nanterre works of the Union des Gaz suffered severely. The waters of the Seine invaded the works to such an extent that they reached the ash-pans of the ovens in the retort-house. The coal conveyors and elevators were stopped, and 120 tons of coal per day had to be carried by men from the coal-store some distance away to the hoppers on the third storey of the retort-house. Notwithstanding these difficulties, and in spite of the fact that the whole district supplied by the Nanterre works was under water, the regular supply of gas was maintained without interruption, thanks to the admirable efforts and devotion to duty of the Manager (M. Lhomme) and his excellent staff. A word of praise was also due to M. Moussoir, the Manager at Montargis, and his staff for their conduct during the floods.

### THE STRIKE IN ITALY.

When he addressed the proprietors last year, he dealt very fully with the great strike at the Italian works of the Union des Gaz, from which the Company were at the time emerging. He told them that the object of the Board of the Company in facing and seeing through so serious a strike was "neither to reduce wages nor to curtail the privileges and advantages of the men with regard to pensions, sick-pay, &c.," but simply and solely "to restore to the Company such control of its works as was absolutely essential for efficient and economical working." He was happy to tell the proprietors that this object had, in a very large measure, been attained. At Milan and at Genoa, and also at the two smaller Italian stations of the Union des Gaz, discipline had been re-established, the services of a large number of superfluous men had been dispensed with, individual efficiency had been increased; and the works now presented the appearance of better and more economically organized industrial establishments. The result was a very decided improvement on the working both in the retort-houses and in the yards. He had before him statistics relating to the past eight months. He would not trouble the proprietors with them, but would content himself with saying that they were very encouraging. It was true that a portion of the increased production of gas must be attributed to new and improved plant; but under the old *régime*, new plant did not always yield the satisfactory results expected of it. From all the Italian stations, the managers and engineers reported, and the Directors of the Union des Gaz had seen for themselves upon their visits to Italy, a greatly improved demeanour on the part of the men—a willingness and an alertness which were conspicuously absent in former times. Under these circumstances, it would be a pleasure, as well as a duty, for the Directors of the Union des Gaz to foster this better spirit, and to endeavour that those who deserved it might share in the results of their increased exertions.

### STARTING THE NEW YEAR FREE FROM LEGACIES OF THE PAST.

But, while he stated with satisfaction that the sacrifices the Union des Gaz made in combating this strike were now beginning to find a reward which would in time amply justify the action of the Board, he had to admit that the strike was a costly business. It was immediately followed by the floods in France, and by a mild winter, which brought about a serious fall in the selling price of coke. Then the charges for interest and redemption of bonds, issued to finance the construction of the new works, weighed with exceptional heaviness on the year's accounts, owing to the fact that these new works were not in full action, and were not earning anything like their maximum profits. The result was that the Union des Gaz had to face at the same time a greatly increased expenditure, and a temporary inelasticity of revenue. The Directors of the Union des Gaz decided to meet the position boldly, to

reduce the dividend from 9 per cent. to 7½ per cent., and to write off the whole of the expenditure caused by the strike and the floods, partly out of profits and partly by taking a considerable sum from the special reserve. By adopting this course, they were able to start their new year unencumbered by any legacies from the past year. He thought it was clear that the policy of the Board was approved of by the general body of proprietors and investors, because the price of the Company's shares on the Paris market rose after the declaration of the reduced dividend. So far as the Union des Gaz were concerned, they entered upon their new year (as he had already stated) unencumbered, with coal prices in their favour, and so far as one could judge, with a fair prospect of industrial peace and of increased efficiency within the works. If coke sold well, and fetched a good price, the coming year should be a prosperous one.

THE POSITION AT MESSINA.

Turning now to the affairs of the Continental Union Company which concerned them more immediately that day. Last December he put before the proprietors very fully the position of the undertaking at Messina; and he told them that the situation was a complicated and delicate one, that the Directors were fully alive to the duty they owed to the stockholders, and would endeavour to make the best they could of a bad business. They had been engaged upon this task throughout the whole of the past year; and a very anxious and difficult one it had been. In the first instance, they sent to Messina Mr. Bickley, the Engineer in charge of the Sampierdarena works of the Union des Gaz at Genoa, with instructions to provide the Board with a technical report, giving details as to the condition of the works and mains, the probable cost of reinstatement, and the prospects of both immediate and ultimate business in Messina. It was essential to have such a report before the Directors could determine upon their best course of action. Mr. Bickley informed them that the works themselves could be reinstated at comparatively small cost—that the damage done by the earthquake was by no means irreparable, but that the whole system of canalization was practically useless. The fine city they had lighted for so many years, with its esplanades, wide streets, prosperous shops, and immense public buildings—all making a large demand on the output of their works—was still a heap of ruins, and a new town (consisting of wooden huts housing a population of 70,000 people) had grown up to the west of the old city on the far side from the works. Mr. Bickley reported that it was this temporary town the Company would have, in the first instance, to canalize and light, with the prospect of doing the work all over again as and when the new city of Messina arose from its ruins. Moreover, the Royal Commissioner, who, for the time being, exercised the powers and functions of the Municipal Council, informed Mr. Bickley that one of the conditions which would be imposed upon the Company in any negotiations for a new contract would be the eventual removal of the old works from its present site on the seashore to a new site upon the port. Taken as a whole, Mr. Bickley's report did not leave a very encouraging impression upon the minds of the Board. The proprietors might ask—and he thought it natural they should ask—why the Board did not abandon at once the concession and cut the loss. Well, there were always two parties to a contract; and it was not easy for one of the parties—even after an earthquake—to walk away from it, especially when he would have to leave so much behind as the Company would be compelled to do. Moreover, they had to consider the town debt as well as the concession and works. They felt that, given certain conditions which they regarded as absolutely essential, it might be better business for the Company to take on a fresh contract. With this view, early in the year, the Directors submitted certain proposals to the Royal Commissioner, which dealt with both the town debt and the future of the gas undertaking at Messina. Since these proposals were submitted, negotiations had been going on practically without a break. In the late spring, Colonel Le Roy-Lewis, Mr. A. F. Phillips, and he (the Chairman) visited Italy; and they endeavoured to meet the Secretary of State and the Royal Commissioner in Rome. But the visit of the King and Queen of Italy to Sicily, which occurred at that particular time, made such a meeting impossible. In September, Mr. Phillips, accompanied by the Secretary (Mr. Martio), went to Messina; and under the advice, and with the assistance of, the Company's distinguished advocate at Genoa, and with the help of their legal adviser in Sicily, carried on personal negotiations with the Royal Commissioner. It was agreed that the parties should meet at a later date in Rome, where it was anticipated that a final agreement would be arrived at. In November, Mr. Phillips and Mr. Martin returned to Rome, and renewed the negotiations, with the assistance of the Company's Italian legal advisers. Finding that the conditions upon which alone the Board were prepared to undertake a new contract encountered insurmountable opposition from the authorities, their negotiators made proposals, which, on the one hand, dealt with settlement of the town debt, and, on the other hand, sought to free the Company from all responsibility whatever for the future. A basis of agreement appeared to have been arrived at; and he had had every expectation of being able to announce it that day. The Royal Commissioner had, however, he feared, again changed his mind. In any case, the Board had not yet received the definite reply which had been expected through the medium of Mr. P. S. Morton, the Manager at Genoa, who had rendered valuable assistance throughout the negotiations. This being so, and the negotiations being at a critical stage, it was impossible for him to be as explicit with the proprietors as he should like to be, lest, by any words of his, he should prejudice the negotiations. He could only repeat what he said last year, that the Directors were fully alive to the importance of making the best of a bad business for the stockholders. To this he adhered. From what he had said, it would be seen that, in drawing up the balance-sheet, the Directors could only deal with the accounts as they were at the time. Negotiations were in progress; and any attempt to deal drastically with the Messina assets in the balance-sheet would inevitably have prejudiced the negotiations. They would take his meaning without him dotting the "i's" and crossing the "t's." The Board therefore continued the policy that the proprietors approved of last year. He remembered Mr. H. E. Jones expressed his appreciation of the courage and sound finance of the Board. They had continued this policy, and had taken £10,000 from the profits of the year, and carried it to the Messina amortization account. This now stood at £32,000, reducing the amount to the debit of the Messina outlay to £48,446, which he would point out was almost balanced by, or at all events did not largely exceed, the sum which stood to the credit of the reserve fund. He need hardly say that, whatever might be the outcome of the Messina negotiations, the Board would next year make proposals for dealing with the Messina items in the accounts upon simple but adequate lines.

THE ACCOUNTS.

Turning now to the accounts for the year, he would ask the proprietors to look at the general revenue account. On the left-hand side, it would be seen that the charges for management were much the same as last year. There had been certain adjustments. A pension had been transferred from this account; but, on the other hand, there had been no contribution from Messina towards general charges as was the case in previous years, the effect of which was to reduce the total. The item for pensions was new. It was due, of course, to the liquidation at Messina. They had certain obligations to the survivors there; and these had now all been settled. On the right-hand side, the notable and important item was the reduction in the dividends received from the Union des Gaz by £12,104. Of this, the proprietors were informed in the report. The effect of the drop in the receipts was to reduce the balance carried this year to net revenue to £54,012, as compared with £67,098 last year. Adding to this amount the balance of £12,954 brought forward from June 30, 1909, it would be seen that the total amount of undivided profits the Directors had to deal with was £66,966. Out of this amount, it would have been possible to pay a 5 per cent. dividend, and to carry forward a substantial sum; but the Directors, with a full sense of responsibility, and a complete knowledge of facts before them, preferred to ask the proprietors to pass £10,000 to the Messina amortization account, in pursuance of the policy approved last year, and to agree to a dividend of 4 per cent. for the year, carrying forward £11,783. The Board were satisfied that it was in the best interests of the stockholders themselves to submit to this temporary sacrifice of dividend, for they fully believed that nothing so effectually strengthened the permanent position of a Company as prudent finance.

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) seconded the motion.

Mr. EDWARD CLARKE said there was one question which suggested itself to him, though the time was probably not yet ripe, in view of the pending negotiations, to deal with it. In the first place, it seemed that the proprietors might look upon Messina, and the large sum absorbed by it, as now being the subject of a sort of arbitration; but they were apparently very unlikely to continue operations there. If this were so, it was surely a matter for the consideration of the proprietors, and for the recommendation of the Board, whether the time had not come when they should deal with their Union des Gaz shares—deal with them in the nature of a trust; and let the French on their part absorb them at the price at which they now stood on the Paris Exchange.

Mr. R. STEVENS asked for an explanation of what appeared to be an apparent discrepancy in the shares held in the Union des Gaz now and in the previous year. This year the number was 40,019, valued at £822,076; while the previous year the number was 40,839, valued at £847,781.

Mr. CAVE ORME said he should like to associate himself to some extent with the remarks made by Mr. Clarke. It might not be prudent to carry into effect the suggestion at the present time; but it was one the Board might take into consideration.

Mr. LEONARD R. WILKINSON desired to dissociate himself from the last two speakers. He believed there was great vitality in the gas business. With the conservative finance incorporated with the Company, he viewed the position with great confidence. While it was difficult to get any big town in these days, small places and the suburbs of large towns might be obtained in which to extend business. He was a great believer in the future of the gas industry; and he hoped the Board would continue.

The CHAIRMAN observed, with reference to the remarks of Mr. Clarke and Mr. Cave Orme, that he was glad they agreed with the Board that the time had not arrived to consider the question raised; but it would, he could assure them, receive the Directors' most careful and respectful consideration. He thanked Mr. Wilkinson for his views as to the future of the gas industry. He assured him that the Board concurred with him. As to the difference in the figures which Mr. Stevens saw in the balance-sheet for this and last year, it arose from the fact that, during the year, the Directors sold a certain number of the Union des Gaz shares. When the last issue of Union des Gaz shares was made, the Board took up rather more than they wished for; and it was always their intention, as opportunity offered, to sell some of them. They had sold a certain number during the past year—about 800—at a profit; and the proceeds of the shares appeared in their assets, either under cash or investments. This was the entire explanation of the difference.

On the motion of the CHAIRMAN, seconded by Mr. N. E. B. GAREY, dividends were declared of 4 per cent. on the ordinary stock (free of income-tax), and 7 per cent. on the preference stock (less income-tax), deducting the interim payments of 2 and 3½ per cent. respectively.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, Mr. Garey was re-elected to his seat on the Board, as was also Colonel Le Roy-Lewis, on the motion of the CHAIRMAN, seconded by Mr. R. S. GARDINER.

Moved by Mr. BERNARD F. HARRIS, and seconded by Mr. R. STEVENS, the Auditors (Messrs. A. T. Eastman and C. P. Crookenden) were re-appointed.

The CHAIRMAN moved that the thanks of the proprietors be given to the Secretaries, Managers and Engineers, and the staff of the Company and of the Union des Gaz, both in London and abroad, for the able services rendered by them during the year. No one, he said, knew better than the Directors how loyal and how great were these services. Their Secretary was indefatigable; and their whole staff in London did their work with great devotion. With regard to the staff abroad, he had personally the warmest appreciation of the services of each member. He should like Mr. Phillips, who was in constant contact with these gentlemen abroad, to say a few words.

Mr. A. F. PHILLIPS said he had much pleasure in seconding the motion. He had visited during the past year the principal stations of the Companies several times; and he could testify to the loyal devotion of all their Managers to the best interests of the Company. It was difficult for any gentleman who had not been connected with the gas business, especially the gas business in Italy, to appreciate the numerous difficulties with which these gentlemen had to contend. They had to be continually on the watch. On the one hand, the public authorities were most exacting in having every condition in the contracts fulfilled; and, on the other hand, the labour question was continually causing difficulties. The proprietors would be surprised if they knew the number of arbitrations their Managers, especially in Milan and Genoa, had to attend to decide questions which were raised by the workmen; but he could assure the proprietors that, under all these difficulties, their Engineers were devoted to their interests, and they might be relied upon to obtain the best possible results they could.

The CHAIRMAN remarked that Colonel Le Roy-Lewis had since his election visited every one of the stations of the Union des Gaz.

The motion was heartily agreed to.

The SECRETARY having acknowledged it on behalf of himself and his fellow officers,

Mr. WALTER HUNTER, in proposing a vote of thanks to the Chairman and Directors, remarked that the proprietors were rather disappointed at the result of the year's working. But they also felt that the Board had been in a difficult position; and they were quite certain the Directors did the best possible to improve the position. There was one matter upon which the Chairman gave them some hope, and that was with regard to the improved relations with the workpeople. He (Mr. Hunter) must confess that sometimes he had thought the Board had shown a little want of courage in dealing with their workmen. He knew the difficulties to which Mr. Phillips had alluded; but the proprietors had confidence that the results of the courage displayed on a recent occasion would encourage the Board to take a similar course in the future.

Mr. A. W. OKE seconded the motion, which was cordially passed.

The CHAIRMAN, on behalf of himself and his colleagues, thanked the proprietors for their vote of confidence. In reply to Mr. Hunter, he might say the Board were fully sensible of the feeling underlying his excellent advice; and they were continuing to consider in what way, now that discipline was restored, they could gradually improve the position of their workpeople.

**Gas Supply in Amman Valley.**—The supply of gas manufactured in the Amman Valley, Carmarthenshire, has received a considerable impetus by two successful exhibitions which have been held in Ammanford and Garnant within the past fortnight. The Gas Company are extending their mains in all directions, and will ultimately embrace a growing and largely populated district which at present contains upwards of 30,000 inhabitants.

## LISBURN GAS-WORKS PURCHASE.

### Terms of the Agreement.

In the last number of the "JOURNAL" (p. 730), it was mentioned that an agreement had been come to between the Lisburn Urban District Council and the Gas Company for the purchase of the undertaking of the latter for the sum of £33,000. At the monthly meeting of the Council on Monday last week, the Town Solicitor (Mr. Wellington Young) made an interesting report on the subject, in which he recounted the circumstances which led to the settlement, and explained its terms, which are as follows.

1.—Possession to be given to Council on Dec. 31, 1910.

2.—Company to pay all expenses of working up to that date.

3.—Accounts furnished by Company as at the 1st of December to be collected and retained by Company; and the Council not to be responsible in any way for their collection.

4.—The Council to be entitled to the benefit of all gas supplied by the Company as from the 1st of December up till the 31st of December, including gas supplied for public lighting, and to collect and retain the price for its own use.

5.—On the 31st of December the quantity of gas in the holders and pipes to be measured by a person mutually agreed upon, and to be paid for by the Council at the ordinary consumers' prices without discounts being deducted.

6.—Stock of coal, coke, and all other stores and consumables which the Council are to take over under the Act, save the above, to be taken by a person mutually agreed upon, who shall also fix the price to be paid by the Council to the Company therefor. The figure so fixed shall bind both parties, and shall be paid by the Council at their first meeting after being ascertained.

7.—The amount to be put into the award shall be the sum of £32,145, which, with the further sum of £855, making together the sum of £33,000, shall be paid on Dec. 31, 1910; and this shall cover all that the Council are to pay, exclusive of costs, and save the amounts which may be fixed by the arbitrator or valuer under the last two preceding clauses.

8.—The Council, on taking possession, to take over all existing contracts for the supply of coal, material, and other stores, and to be entitled to all benefits derivable therefrom. They shall also take over all the employees under their existing engagements.

9.—An agreement embodying the above terms, and nominating the arbitrator or valuer to act under the fifth and sixth clauses, to be sealed on or before Dec. 6, 1910.

In closing his report, Mr. Young said: "I consider this a most satisfactory arrangement, as it will avoid a very considerable amount of expense, and the £855 will, in my opinion, all be paid back to the Council in the gas accounts paid by consumers, the saving in the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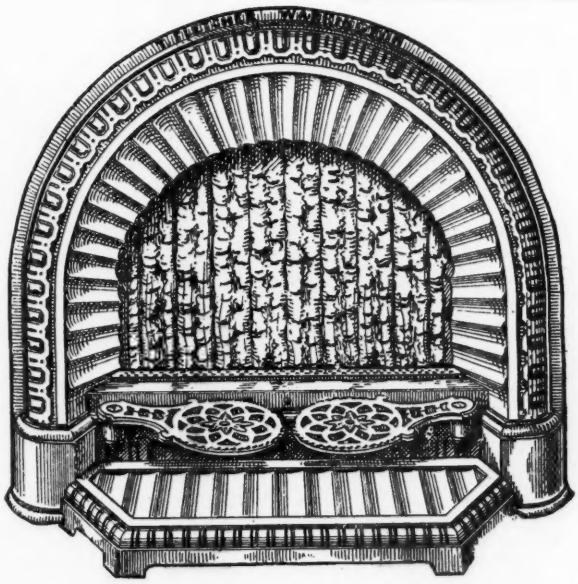

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like others can, as it has been fitted to our fires for

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it is also interchangeable, but we cannot call it NEW.

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**"Imitation is indeed the sincerest form of flattery."**

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lighting of the town, and the profit on the coal contract. I forwarded copy of the consent to your Parliamentary Agents, and received a letter from Mr. Lees stating that he was perfectly satisfied with the arrangement, and that we had made a good bargain. As the contract must be completed and the works taken possession of before your next monthly meeting, I recommend that a paying order should be drawn on Monday, Dec. 5, in favour of the Gas Company for £33,000, to be held over until possession is given, and that a Sub-Committee be appointed to attend with the Town Clerk and myself at the gas-works on the 31st of December to take over possession. As the stock of coal and consumables is the only remaining matter to be dealt with, and as this must be done by one valuer mutually selected, or, failing such selection, by a valuer appointed by the Board of Trade, Mr. Barbour and I consented to the appointment of Mr. Wilfred Tallantyre, Gas Manager at Lurgan. The other side consenting, the Town Clerk and I had a meeting at the gas-works in Lisburn on the 2nd inst. with Mr. Stevenson as representing the Company, and Mr. Tallantyre, when I pointed out to the latter the different matters of which he was to make a valuation, and fixed his fee at £15. The amount which will be found by the valuer will have to be paid at or before the monthly meeting of the Council in February. This will conclude the entire arrangement, which I consider, on the whole, most satisfactory to the Council and the ratepayers."

The Council considered Mr. Young's statement very satisfactory.

## SALFORD GAS PROFITS.

### Labour Councillor and Alleged Loss in Slot Meters.

On the minutes of the Gas Committee being presented for confirmation at last Wednesday's meeting of the Salford Town Council, Mr. Purcell, one of the Labour members, asked the Mayor (Alderman Phillips), as Chairman of the Gas Committee, to answer the following: (1) The total sum paid from the gas undertaking to the district fund, from the first payment to the end of the last financial year. (2) The total sum paid to the borough redemption fund to the end of the last financial year, also the date it commenced. (3) The total net profits, since the inception, transferred to the district fund. (4) The number of ordinary gas-meters at present in use in the borough in the houses where rates are paid to the Corporation direct by the tenant. (5) The number of ordinary meters at present in use in the borough in houses where the rates are paid by the owners, agents, or others than the actual tenant.

The Mayor said that, as Mr. Purcell was a member of the Gas Committee, the proper method for him to obtain the information required was to move at the Committee meeting that it be obtained.

Mr. Purcell observed that the reason he brought this matter before the Council was because he had been told they were losing £150 a year on the slot-meters.

## WESTMINSTER STREET LIGHTING SPECIFICATION.

### Explanation by the City Engineer.

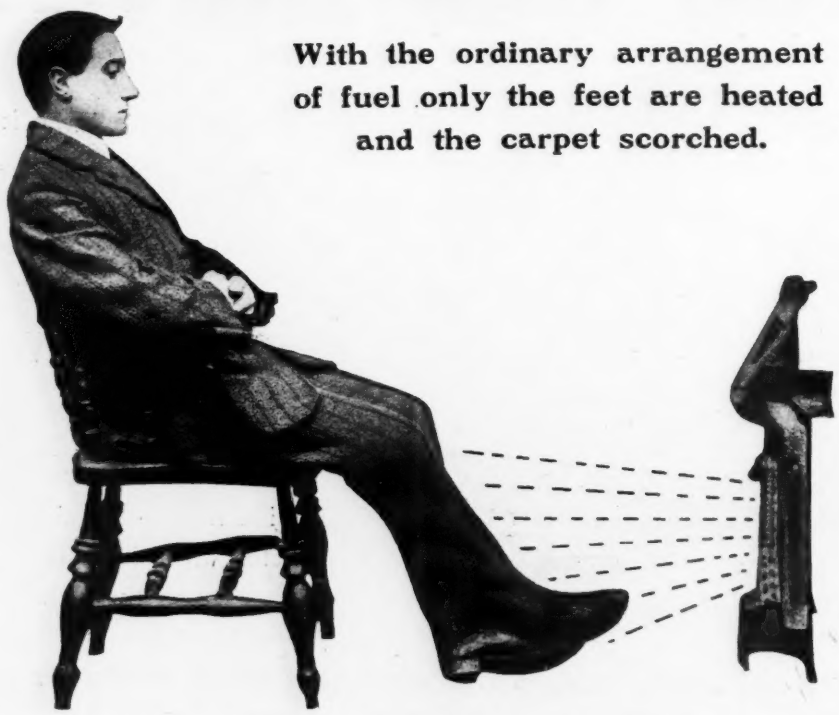
In the course of the paper read by Mr. Haydn Harrison, at a recent meeting of the Institution of Electrical Engineers, on "Street Lighting by Modern Electric Lamps" (some extracts from which were given in the "JOURNAL" last week), reference was made to the somewhat unique character of the specification on which the tenders were based for the Westminster street-lighting contract, which, as readers are aware, has been secured by the Gaslight and Coke Company. This specification having been referred to by the "Contract Journal" as the production of Mr. Jacques Abady, the Chairman of the Works Committee of the Westminster City Council, the City Engineer (Mr. J. W. Bradley, M.Inst.C.E) sent to that publication the following letter.

The specification in question was prepared by myself, as Engineer responsible for the work, on the framework of similar specifications drawn up by me during the past ten years, in which "measured candle power per lamp in position" is the basis of the contract, instead of "energy consumption" generally customary. I believe prior to the issue of my first specification on this basis in 1901 on no occasion had specifications been issued which allowed of tenders for street illumination by gas, oil, or electricity being considered strictly on their merits, and entirely apart from such questions as size of units, height and spacing of columns, &c. Competing schemes of gas and electricity usually differed widely in these respects—rendering difficult an economical consideration of different illuminating media.

On the basis of the 1901 specification previously referred to, the City of Westminster adopted for the first time in England a system of large units (some 900-candle power street measure, since increased in size to 3000-candle power street measure) of gas-lights on high columns at a greatly reduced cost, illumination considered, per mile of street, as compared with that previously existing; and since then other contracts for both gas and electric lighting have been similarly entered upon. . . . I have not at any time found such a specification other than a most convenient and workable one. It provides means of contracting satisfactorily for the supply of street illumination on a strictly competitive and definitely comparative basis for either gas, electricity, or oil, and further permits of a ready test at any time to ascertain if the conditions of supply are being fully observed by the contractors.

Messrs. John Wright and Co.'s "St. Andrew" gas-heated steam radiators have been installed for heating the premises of the Civil Service Co-Operative Society, Limited, at 28, Haymarket, S.W. We understand they have been fitted throughout the entire building.


THE WRONG POINT OF VIEW



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## COST OF GAS AND COAL FIRES.

The interview between a deputation from the Manchester and Salford Sanitary Association and the Manchester Corporation Gas Committee, with regard to the mitigation of the smoke nuisance (which was reported in last week's issue), has led to some correspondence in the "Manchester Guardian"—the point referred to being the cost of a gas-fire as compared with a coal-fire.

The first letter, signed "A Working Man," pointed to a statement in the paper to the effect that if gas could be sold at about 1s. 9d. per 1000 cubic feet, it would be as economical as coal for heating purposes. The writer said: I am a working man, and live in a small house, the lower rooms of which are parlour and kitchen. We burn coal in the kitchen from about 7 o'clock in the morning till 11 at night, using on an average not more than 2½ cwt. per week. So for 2s. 6d. we get a fire of coal for seven days of 16 hours at about ¼d. per hour. In the parlour, we have a gas-stove, such as the Corporation sell and recommend. By carefully watching the gas-meter index, I find it burns about 35 cubic feet per hour, which costs 1d.; so that if I burn the gas-stove for the same length of time that the coal-fire is used, it will cost me over 10s. per week, or if gas were reduced to 1s. 9d. per 1000 cubic feet about 8s. per week. Of course, a gas-stove in a parlour is not burned like this; but if it is to supplant the kitchen fire, it would have to be burned like this, or it would be of no use. Also I have tested with a thermometer the warming power of the coal-fire, and found it at least twice as efficient as the gas. Apart from this, there is the comfort and appearance of the coal-fire. When I look at the gas-stove, I feel like Scrooge's clerk, who tried to warm himself at the candle. Surely there is something wrong in the statement that gas at 1s. 9d. per 1000 cubic feet would be as economical as coal for heating purposes.

To this Mr. J. W. Graham, Principal of Dalton Hall, replied: The thoughtful letter from "A Working Man" states that the cost of gas at 1s. 9d. per 1000 cubic feet compared with coal at 1s. a cwt. would be about as 8s. is to 2s. 6d. As I was responsible for suggesting at the recent deputation to the Gas Committee that gas at 1s. 9d. was about as cheap as coal, I may perhaps be allowed to extend my statement a little in reply to your correspondent. His figures are probably correct. They are in harmony with the elaborate report published by the Coal Smoke Abatement Society in 1906, after a month's test of 25 stoves. The report may be obtained from the Society at No. 25, Victoria Street, London, S.W., for 3d. The report says: "When the initial raising of the temperature of the rooms had been accomplished and the fires had produced a fairly steady rise, the cost per hour for each degree of rise in temperature was about four times as great with the gas-fires as with the coal." This took gas at 3s. per 1000 feet and coal at London prices. It is also to be noted that gas-fires are improving with great rapidity, and that the best obtainable now are much better than they were five years ago. But now I come to the reasons which have led me to the conclusion that in many cases the extra cost of a gas-fire would be very little. (1) Gas-fires heat a room much more quickly than a coal-fire does, because of the time taken to get the coal-fire into a hot condition. (2) The coal that is wasted in lighting-up and in dying-down is saved by using gas. (3) The firewood, the chopping of it, and the laying of the fires are saved. (4) The labour involved in housing the coal, shovelling it and carrying it into the rooms, cleaning out the grate, taking the ashes away and disposing of them, is all saved. (5) Through the absence of dust, the hygienic quality of a gas-fire with a good draught is better than that of a coal-fire. It does not vitiate the air of the room, nor does it produce any drying effect as is popularly supposed. (6) It is not necessary to keep the gas-fire on all day. Even in a working-class kitchen there are probably many hours in which the gas can be turned off; and if a gas-cooker is used, there need be no fire the whole of the summer. I believe this point to be the greatest economy of all. It will be plain that for passages, consulting-rooms, offices, dining-rooms, bedrooms, drawing-rooms used in the evening only, and all the numerous rooms which in the houses of the middle class are not in constant use, gas-stoves offer many advantages. The deputation had also manufacturing smoke in view. Here the use of gas can be much more economically conducted, and it appears to be generally agreed that gas at 1s. 6d. to 2s. per 1000 cubic feet can compete with coal. The cost of fuel at the 25 Metropolitan electric light undertakings was found to be equal to the cost of gas at 2s. 1d. per 1000 feet. I hope the Gas Committee will adopt the suggestion of lending out gas-fires free and fitting them for nothing.

## COST OF ALTERING GAS-MAINS.

At the Meeting of the London County Council last Tuesday, the Improvements Committee reported that, in connection with the widening of Woolwich Road, which is being undertaken by agreement with the Greenwich Borough Council, certain mains belonging to the South Metropolitan Gas Company will be brought under the carriageway instead of being, as at present, under the footway, and the depth of cover will be reduced. The paving works outside the tramway area are being executed by the Borough Council; the County Council contributing two-thirds (not exceeding £8000) of the cost. A question arose between the Borough Council and the Gas Company as to the liability for altering the mains at a certain point in the road where the works are being executed under the Metropolitan Paving Act, 1817 (Michael Angelo Taylor's Act); and, as the matter was urgent, it was suggested, as a compromise, that the Company should bear one-third of the cost, and that the remaining two-thirds should be regarded as coming within the arrangement as to paving made between the County Council and the Borough Council. The Company who will do the work to the mains state that the cost will probably be about £100, and will certainly


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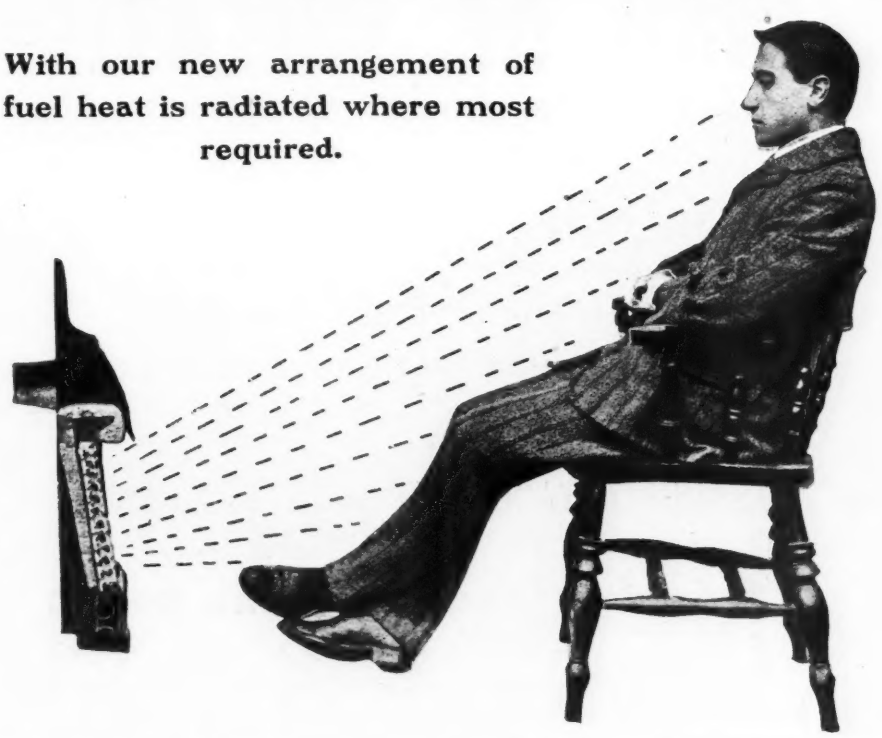

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not exceed £150. The Committee were advised that the proposal was reasonable; and as provision for the expenditure had been made in the estimate of £62,850, already approved by the Council and in the capital votes for 1910-11, they recommended that, subject to the Company bearing one-third of the cost of the alterations referred to, the remaining two-thirds be regarded as part of the cost of the works. The recommendation was adopted without debate.

## SCARCITY OF GAS COKE AND COAL-WAGGONS.

This subject was dealt with in a leading article in the "Iron and Coal Trades Review" for the 2nd inst. In the course of it, the writer made the following remarks.

At the present time there is quite a gas-coke famine in the land. Not for years have factors and merchants had so much trouble and anxiety in meeting the requirements of their customers, which have naturally increased very considerably with the continuance of the cold weather. Prices have risen something like 3s. per ton within the past two or three weeks. Buyers, finding supplies short, have hurried into the market with orders for prompt delivery, with the result that for the moment the demand apparently exceeds the make, and very little best gas coke can be obtained in London at less than 20s. per ton, while more has to be paid in some cases. The Gaslight and Coke Company's price is 17s. per ton at the Beckton works, as compared with the current contract rate of about 14s. 6d.; while inferior Sheffield and Bristol cokes are quoted at about 18s. and 19s. 4d., respectively, at London stations.

Various reasons are advanced to account for the present position. It is pointed out, for example, that the increasing number of water-gas plants has decreased the quantity of coal carbonized, and consequently the output of coke, and also led to the consumption of coke at gas-works themselves. Then, again, the bright weather of late and the comparative rarity of fogs have diminished the amount of gas burnt and so reduced the make of coke accordingly; while the activity in the cement trade has greatly increased the consumption of the latter. Moreover, there is the prevailing scarcity of waggons to be taken into consideration; this adding to the difficulty of obtaining adequate and prompt supplies of gas coke. Waggons are rarely plentiful about Christmas—being taken out of the coal trade to meet the exigencies of the special holiday goods traffic. But this year the shortage has occurred earlier than usual, probably owing in some measure to the General Election, which will absorb the energies of a substantial section of the public having more than the average purchasing power during the greater part of this month.

Some collieries are suffering badly from want of waggons, a large number of which are under load at shipping ports—the export trade being quiet; and coal, as well as gas coke, is not reaching buyers promptly. There is not likely to be a much better waggon supply this side of Christmas; but with shorter and darker days, the make of gas coke will probably increase, and become more nearly equal to the demand in the near future. At the present time holders who bought on the open market before the recent rise, or who have supplies available under contract, and are able to give prompt delivery, are making substantial profits.

## GAS AND ELECTRICITY AT HASTINGS.

### Questions as to Cost and Efficiency.

At the Meeting of the Hastings Town Council last Friday, Mr. W. A. Matthews put the following questions to the Chairman of the Electricity Committee (Mr. Clement Hill): (1) What is the candle power of the electric lamps recently installed in some parts of the borough? (2) What was the candle power of the gas previously used? (3) How do you account for the general opinion existing in several parts of the borough that the new system of lighting the streets by electricity is inferior as an illuminant to the previous system of public lighting? (4) What is the amount charged per unit for current supplied to public lamps? (5) What is the average cost per unit without capital charges? The replies were: (1) 45-candle power, British. The candle power drops very little during the life of the lamp. (2) Nominally 50-candle power; but the candle power of gas-mantles, as is well known, drops very rapidly and considerably. Many of the mantles in the street-lamps are also smaller than others. (3) So far as my own observation goes, and the observation of the people I meet, the illuminating power of the electric lamps is fully equal to that of the gas-lamps displaced. I make frequent inquiries as to the opinion of others, and the answer is almost invariably the same. The very few people I myself have personally met who were of a contrary opinion happened to be interested in the sale of a competing illuminant. Possibly a similar interest influences the opinion of others. (4) The charge made to the Public Lighting Committee for each street lamp lighted by electricity is £3 5s. 8d., which was the sum paid to the Gas Company at the time the arrangement was come to. Of this sum, £2 0s. 10d. represents the charge for current, which is calculated at 2d. per unit. (5) Taking the figures for the year ended March 31, 1910, the cost of production, without capital charges, is as follows: Cost of coal and coke, 1·06d. per unit; other expenses (including oil, stores, &c., wages, repairs, maintenance of buildings and machinery, repairs and maintenance of mains, rents, rates and taxes, management expenses, insurance, and bad debts), 1·8d. per unit—total cost of production per unit sold, 2·86d. The expenditure on everything except coal is obviously exactly the same, whether or not the street-lamps are lighted by electricity. Hence the electric light concern makes a profit of 0·94d. for each unit supplied to the street-lamps, or a total profit of 19s. 2d. per lamp per annum. There will also be a further profit of several shillings per lamp in renewals.


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## UNPROFITABLE ELECTRICITY SUPPLY AT DUDLEY

At the Meeting of the Dudley Town Council last Tuesday, Mr. H. W. Hughes mentioned that the members had before them the decision of the Arbitrator in the matter of the charges made by the Corporation for electric current supplied to the Tramway Company. He said that the terms had been readjusted by the Arbitrator, and he (the speaker) reckoned that the Corporation would lose £1000 a year. This was disappointing; and unless they succeeded in getting a revision by means of costly litigation, the new terms would have to run for five years. He was sure they all tried their best to make the electricity undertaking a success. A Sub-Committee had been formed to pay particular attention to this department of the Corporation. Alderman Cook pointed out that the arrangement with regard to the supply of electricity was part and parcel of the tramway purchase agreement, the rental from which would give them a profit. Mr. S. C. Lloyd asked whether it was not desirable to dispose of the undertaking, and make an effort to acquire the gas-works. Mr. Hughes admitted that during the past year there was a loss on the work amounting to £600. The sum of £1169 was transferred from the reserve to the capital fund to pay for motors, &c. He added that the arbitration had not been in vain; the price awarded being better than that which was offered. Referring to Mr. Lloyd's suggestion as to the desirability of the Council disposing of the electricity undertaking, a local paper characterizes it as a "somewhat ingenuous" one on his part, after deploring the loss incurred in connection with it. The matter then dropped.

### Lecture to Brentford Gas Company's Employees.

The meeting of employees of the Brentford Gas Company on the 30th ult. was addressed by Mr. Thomas Glover, with particular reference to the special gas-fires made by Messrs. R. & A. Main. The lecturer dealt with the matter in a thoroughly interesting and practical manner, and succeeded in showing that it is possible to introduce a considerable amount of humour even into so prosaic an article as the gas-fire. The instructions given, particularly in regard to the "D.S.O." and "St. Nicholas" fires, are bound to be helpful to all who have any connection with their fixing and maintenance.

**St. Petersburg Drainage and Water Supply.**—The question of the drainage and water supply of St. Petersburg is again agitating the minds of the Russian authorities. It appears that some time ago a Special Commission was appointed to inquire into the whole matter, with power to obtain such technical advice as they thought proper. The Commission recently retained the services of Sir Alexander Binnie, Son, and Deacon, to report and advise generally on the question. Sir Alexander and his son, Mr. W. J. E. Binnie, lately left London for St. Petersburg.

## NOTES FROM SCOTLAND.

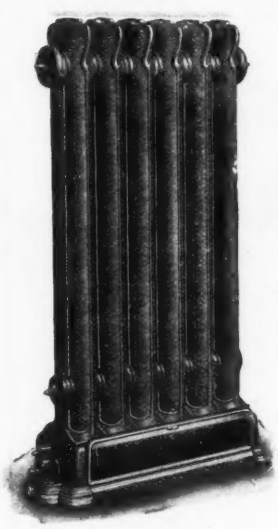
**From Our Own Correspondent.**

*Saturday.*

There was a very good attendance of members of the Scottish Junior Gas Association—Eastern District—this afternoon at the works of Messrs. James Dougall and Son, Limited, fire-brick manufacturers, of Bonnybridge. This is not the first occasion on which the Company have entertained the Association; the Western District having been similarly received by them three years ago. As on that occasion, so to-day the whole of the working in fire-clay was shown and explained, and much was seen which will be of value to the visitors in their business life. The feature of the gathering which was of most consequence, however, was the paper by Mr. E. M. Stewart, the Managing-Director of the Company, on "Fire-Bricks." There was much that was instructive in the paper; but the spirit which dictated the contributing of it, and which dominated its entire contents, is not fully capable of being inferred from the paper itself. It is, therefore, fitting that this should be independently and specifically acknowledged. On the merits, among the questions raised perhaps the most important one was that in which the author referred to the heats in different parts of furnaces. On this subject the attitude of Mr. Stewart is the generous one of asking those who require bricks to withstand high heats to take him into their confidence, and he will endeavour to produce an article which will be at least made with a view to meet their requirements. The offer is a fair one, and worth acceptance. Fire-brick is an article which, by variation in manufacture, can be greatly altered in character, and it is not by any means the uniform article it was once considered to be.

On Tuesday evening, about a quarter to seven o'clock, a bad breakdown of the electric lighting service in Glasgow took place; the cause being a short-circuit of a serious nature in one of the trunk mains running between the Port-Dundas and Pinkston power stations, which are about half-a-mile apart. For fully half-an-hour the principal thoroughfares, with the exception of some of those in the outlying districts, were in total darkness; and all private lighting was also extinguished. Much inconvenience was caused by the occurrence. In the streets there was no help for the situation; all that could be done being to wait till the light could be restored. But in some of the public halls and other places in the city, where electric lighting had been introduced, the gas-fittings had not been removed; and these being brought into use again, the inconvenience felt by the audiences was of much shorter duration than was the case generally.

In the Dysart Town Council on Tuesday, the Clerk reported the receipt of a letter from the Secretary of the Gas Company, in which it was suggested that a joint meeting between the Council and the Company should be held to discuss the question of the Council's proposal to claim discount on the burgh's gas account in lieu of wayleave for the Company's pipes. Such a meeting, it was represented, would save time and correspondence, and might result in an amicable arrangement

Davis's Steamless Radiator.

# The Top Position.

THIS must be held by a radiator which RETAINS ESSENTIALS and REJECTS NON-ESSENTIALS.

With steam you *must* have the automatic principle. A governor alone would not reduce the extra consumption required to generate steam and bring the radiator to full working temperature. WITH THE "STEAMLESS," THE AUTOMATIC PRINCIPLE IS NOT NECESSARY.

Davis's "Steamless" (which is the only radiator giving uniform heat distribution without hot water or steam) requires NO EXTRA GAS to attain its full working temperature, and, therefore, NO AUTOMATIC VALVE.

The "Steamless" is fitted with a simple but reliable governor, and its MAXIMUM gas consumption is the same as the MINIMUM consumption of any other radiator having the same heating capacity.

THE "STEAMLESS" IS, THEREFORE, MORE ECONOMICAL.

*YOU ARE SAFEST OF ALL WITH THE "STEAMLESS"!*

The DAVIS Gas Stove Co Ltd. Luton

**Show-Room Addresses** { City Offices: 59, Queen Victoria Street, E.C. ('Phone: 742 Bank.)
Manchester: 4, Victoria Arcade, Deansgate. ('Phone: 4689 City.)
Paris: 82, Rue D'Hauteville.

being come to. The proposal of the Company was agreed to; the whole Council being appointed to confer with them.

Matters such as are dealt with in the preceding paragraph are admittedly infectious. This claim by the Dysart Town Council has presumably arisen as a result of the disclosure, through litigation, of the existence of an arrangement in the neighbouring burgh of Kirkcaldy, existing since 1867, under which the Gas Company have allowed the Corporation a discount of 25 per cent. upon the charge for gas for public lighting, in lieu of paying wayleave. The litigation (see *ante*, p. 584) was called before Lord Dewar in the Court of Session on Tuesday, for discussion upon the relevancy of the action by the Company. Mr. Moncrieff, for the pursuers, said there was a much larger question between the parties, in the shape of an arbitration in a transfer of the Company's undertaking to the Corporation; and there was a probability that in the arbitration all questions between the parties would be settled. It was agreed, therefore, to ask his Lordship not to proceed with the discussion. Lord Dewar thought this was very reasonable; and the hearing was postponed. The proceedings in the arbitration, I understand, may be expected to begin in the second week of January. According to present arrangements, they must be concluded before Jan. 31.

The Town Council of Old Meldrum have resolved to reduce the price of gas from 10s. to 7s. 6d. per 1000 cubic feet, in the hope of increasing the consumption.

The extensions at the works of the Inverkeithing Gas Company, Limited, are nearing completion. The works have been almost doubled in size. In addition to the enlargement of the works, the Company have greatly extended their mains, and have provided a good number of householders with prepayment meters. To meet the additional expenditure, it has been decided to issue a further £1100 of capital, in shares of £1 each, to be offered to existing shareholders for subscription in proportion to their present holdings—being at the rate of one additional share for every three shares now held.

At the monthly meeting of the Dumfries Town Council last week, it was reported by the Gas Committee that a letter had been received from a workman, with reference to his dismissal from employment at the gas-works. It was stated that the Committee having learned from the Manager that he had had to dispense with a number of workmen on account of the introduction of machinery at the gas-works, the Committee, by a majority—the minority being in favour of the writer of the letter being heard—decided that in the circumstances the matter be left in the hands of the Manager. The Gas Committee also reported that, on the suggestion of Bailie O'Brien, they recommended that remit be made to the Committee to consider and report upon the appointment of a chief clerk and cashier for the gas office. It was stated that during the time of the late Mr. Malam, Mr. Dickie was chief clerk and cashier. Mr. Dickie had been promoted to the position of Manager, and it was impossible for him to overtake the work of both offices. The proposal gave rise to a very acrimonious discussion; and it was subsequently withdrawn. The subject of complaint of inconvenience caused to neighbours by the noise of the machinery in the gas-works was again before the Council. It was suggested that the windows in the retort-house on one side be built up, and that those at the ends be filled in with rough glass. The cost, it was stated, would be about £45. This was agreed to. It was also resolved that during the night electric power be used to drive the machinery, instead of a gas-engine. It was agreed to procure a new gas-exhauster, at an estimated cost of £400; and a settling-tank, at the price of £37 10s.

The principal contract in connection with a new water supply for Fraserburgh has been let to Mr. James Hinniburgh, of Glasgow, at a price of £40,000. The work is to be completed in one year.

## CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 805.]

LIVERPOOL, *Dec.* 10.

**Sulphate of Ammonia.**

There is again no new aspect in the market, and throughout the week it has continued quietly steady without change in either tone or value. Notwithstanding the fact of there having been a paucity of fresh business, all tendered parcels have been taken up at the prices lately ruling, and the closing quotations are £12 12s. 6d. per ton f.o.b. Hull, £12 13s. 9d. per ton f.o.b. Liverpool, and £12 15s. per ton f.o.b. Leith. With regard to the future position, consumers are decidedly apathetic, and no further sales have transpired. For delivery over the spring months, manufacturers are asking a small premium on prompt values; but dealers are reported to be soliciting orders at current prices, or even at a slight discount.

**Nitrate of Soda.**

The market remains without any alteration, and holders still require 9s. 4½d. per cwt. for ordinary and 9s. 7½d. for refined quality, on spot.

LONDON, *Dec.* 12.

**Tar Products.**

The markets for tar products have remained fairly firm during the past week. Pitch has been a little steadier, with a fair amount of inquiry for forward delivery. Benzol seems a trifle weaker, and consumers will not pay the prices asked at present by sellers. Creosote is quiet, and business is very difficult in this article. Crude carbolic makers are still firm in their ideas of price, while consumers are just the opposite. Solvent naphtha is quiet; and heavy naphthas are fairly firm.

The average values during the week were: Tar, 17s. to 20s. 9d. *ex* works. Pitch, London, 34s. 6d. to 35s.; east coast, 33s. to 34s.; west coast, Clyde ports, 33s. 6d. to 34s. 6d., Manchester, 32s. 6d. to 33s. 6d., Liverpool, 33s. to 34s. Benzol, 90 per cent., casks included, London, 8d. to 8¼d.; North, 7¾d. to 7½d.; 50-90 per cent., casks included, London, 8d. to 8¼d.; North, 7¾d. to 8d. Toluol, casks included,

# Richmond's "MONARCH" Gas-Steam Radiators.

The Simplicity, Economy, and General Design of the "Monarch" Gas-Steam Radiators are proving their worth. Orders continue to reach us in unprecedented numbers.

Richmond's Gas-Steam Radiators have found their way into the homes of the highest in the land, and into buildings of magnificent as well as of unpretentious appearance, and all are doing equally Meritorious and Efficient Duty.

**We can Deliver Stock Sizes Immediately.**

**The RICHMOND GAS STOVE & METER Co., LTD.,**

**Warrington, and 132, Queen Victoria Street, London, E.C.**

INVENTORS OF THE INTERCHANGEABLE "A.B.C." GASFIRE SERIES, COMBINATION DUPLEX TAP & GAS-AIR ADJUSTER, &c.

London, 9d. to 9½d.; North, 9d. **Crude naphtha**, in bulk, London, 3⅝d. to 4¼d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 11⅛d. to 1s.; North, 10⅛d. to 11d.; heavy naphtha, casks included, London, 11⅜d. to 1s.; North, 11d. to 1s. **Creosote**, in bulk, London, 2⅜d. to 2½d.; North, 1⅝d. to 2¼d. **Heavy oils**, in bulk, 2⅜d. to 2⅞d. **Carbolic acid**, 60 per cent., casks included, east coast, 1s. 1½d.; west coast, 1s. 1d. **Naphthalene**, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. **Anthracene**, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

**Sulphate of Ammonia.**

The market remains in about the same position, and prices are unaltered. Towards the close there was a fair amount of inquiry for this month's delivery, which was the means of steadying the prices at several ports. Beckton are now only quoting for spring delivery. Outside London makes are quoted at £12 6s. 3d.; Hull, £12 16s. 3d. to £12 17s. 6d.; Liverpool, £12 16s. 3d. to £12 17s. 6d.; Leith, £12 15s. to £12 17s. 6d.; and Middlesbrough, £12 15s. to £12 16s. 3d.

## COAL TRADE REPORTS.

**Northern Coal Trade.**

There is a fuller demand in the coal trade; but the deliveries are hampered through lack of ready tonnage. In the steam coal trade, the inquiry is better, and prices have been stiffened. Best Northumbrian steams are about 9s. 6d. to 9s. 7½d. per ton f.o.b., second-class steams are quoted at 8s. 6d., and steam smalls are from 5s. to 6s. 3d., according to quality. The collieries are working a little fuller, but there are still occasional idle days. In the gas coal trade, the demand is now at its heaviest point; and the long contracts take up a large portion of the output of the best collieries. Durham gas coals vary in price from 8s. 3d. to 9s. per ton, according to quality, for the usual classes; while for "Wear" specials, up to 10s. 3d. is now quoted for prompt cargoes. There have been some contracts arranged in large quantities for the South of England; and though the price is a little uncertain, it is believed to be about 1s. 3d. per ton below that of the last similar contracts. It is also said that the contracts for one of the great companies have been concluded almost entirely at figures such as these. Coke is firmer; and gas coke maintains a strong price at about 14s. 6d. per ton f.o.b. for good quality.

**Scotch Coal Trade.**

Trade was fairly active last week; ell in particular being in better demand, and splint finding a ready market. An improvement in terms is looked for. The prices now quoted are: Ell, 9s. 3d. to 10s. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 324,642 tons—an increase of 15,892 tons upon the previous week, and of 47,085 tons upon the corresponding week last year. For the year to date, the total shipments have been 14,974,185 tons—an increase upon the corresponding period of 769,490 tons.

## Topical Advertising for the "Ironclad" Gas-Mantle.

The interest taken by the general public in the Parliamentary Elections has been turned to good account by Curtis's and Harvey, Limited, of 3, Gracechurch Street, E.C., the manufacturers of the "Ironclad" gas-mantles. Wherever possible, they have taken space on the election results pages of the leading London morning and evening newspapers, and also of the Provincial morning papers, with this topical announcement:

SPECIAL ELECTION RESULT.

A POPULAR VICTORY.

*1. "Ironclad" Gas Mantles.

*British Made.*

2. All other Gas Mantles.

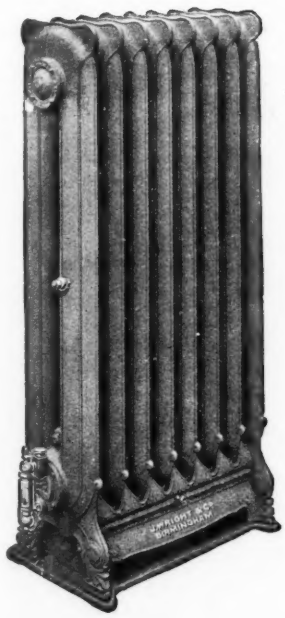
* Sweeping majority.

Actual figures not yet known.

This kind of topical advertising should be appreciated by the trade; for it will be seen that the manufacturer's name and address are omitted, and that the whole idea of the advertisement is to create a demand for the "Ironclad" mantles through ironmongers, gas companies, corporations, and dealers. Not content with newspaper advertising, a similar announcement of these mantles has been flashed on the screens at points in the City and suburbs of London, where large crowds have assembled nightly to get the first intelligence of the result of the polls in London and the Provinces. Similar announcements have also appeared between the election results flashed on the screen during the evening performances at the principal London variety theatres.

**Price of Gas at Ellesmere.**—Complaints having been made as to the high price charged for gas at Ellesmere, Mr. F. Ashley, the Gas Manager, reported to the Urban District Council that he had found on inquiry that 550 gas-works throughout the country charged more and 40 charged the same as they did. Of the 40, all (with the exception of seven) made more gas and were nearer the collieries than they were. When the report came before the Council, Mr. Tims said it appeared to him that they were charging too much, and that the system on which they operated the gas-works was unfair to the consumer. They wanted to get a profit on the gas, and also to make sufficient to pay back the principal and interest. It was not fair that the consumer should be charged the price he was. He thought they should charge a certain portion on the general fund. The Chairman (Mr. B. R. C. Tower) said the question should be brought before the Council at the beginning of the financial year.

*"Simplicity is the first step in Nature and the last of Art."*



The salient virtue of the "ST. ANDREW" RADIATOR is its Simplicity.

It never gets out of order—
there is nothing to get out of order.

Our Patent Automatic Valve is of the very simplest nature, consisting merely of a metal diaphragm, and by its use you get an economy of gas which is impossible without it.

***The last word in Radiator Science—***

**"ST. ANDREW"**

**JOHN WRIGHT & CO.,**
**The Radiator Experts,**
**Essex Works, BIRMINGHAM.**

264.

## Liability for the Maintenance of Stopcock Boxes.

At the Westminster County Court on Wednesday last, before his Honour Judge Woodfall, an action was brought by Mr. Thomas Wickens, of 69, Arkley Road, Walthamstow, against the Metropolitan Water Board, for £100 compensation for personal injuries caused by defective stopcock boxes in the pavement of Arkley Crescent, Walthamstow, which plaintiff alleged to be a nuisance upon the highway. Mr. Dunbar, who appeared for the plaintiff, called evidence to show that Mr. Wickens had been seriously injured by falling over defective boxes fixed outside two houses (Nos. 35 and 37) in Arkley Crescent on the 26th August last, and had since been unable to follow his calling as a fitter, whereby he had lost in earnings £2 a week, besides incurring expenses for medical attendance. Mr. Ross-Brown, who represented the Water Board, cited authorities and statutes to show that the obligation to repair rested upon the owner or occupier of the premises; and he submitted that stopcock boxes were fittings connected with the communication pipes, which were the property of the owner of the premises, and not under the care or control of the Board. He reminded his Honour that in October last he decided in favour of the defendants a similar action which was now under appeal. His Honour said he would defer giving judgment in the present case until the action referred to had been decided by the King's Bench Division.

**Death from Gas Poisoning.**—At an inquest in Liverpool on the body of Louisa Roberts, aged 54, a domestic servant, Miss Poole said deceased had been in her employ for some months, and had been going about her work in her usual good spirits. One morning, however, she went to her room and found her dead; the apartment being full of gas. Deceased had no sense of smell. Medical evidence showed that death was due to gas poisoning; and the Jury's verdict was to this effect.

**"Tarless Fuel" Shares.**—The "Financial News" on Wednesday last called attention to the fact that Messrs. J. H. Iredale and Co., of Liverpool, are pushing the shares of the Tarless Fuel Syndicate, Limited, in the following terms: "In this Company the total capital will be £300,000, of which £100,000 will be working capital, and the remaining £200,000 of shares will be divided among the shareholders of the Syndicate. As the capital of the latter is only £30,000, this will represent a free bonus to shareholders of over six new shares to each Syndicate share held. There can be little doubt that the shares of the new Company will soon be worth considerably more than par. On the results from this flotation alone, the Syndicate shares are consequently much under-valued at their present price, though few shares are now obtainable. On the basis of this flotation, the shares should, at any rate, be worth over £6, apart from other interests." It appears that the firm named were a year ago pushing rink shares in all directions; and our financial contemporary remarks that if Tarless Fuel does no better than the rinks, the purchase will be a poor one.

## Proposed Improved Public Lighting of Kensington.

At the meeting of the Kensington Borough Council last Tuesday, the Works Committee reported that in December last an offer was received from the Gaslight and Coke Company to take over the whole of the public street lighting by gas in the borough. The matter had been referred to the Street Lighting Sub-Committee for consideration; but they saw no reason to justify the Council in abandoning the system under which they have with satisfaction carried out their own street lighting for upwards of thirty years. Dealing with the question of the advisability of the Council at once proceeding to provide lamps of a more modern pattern in the streets of the borough, the Sub-Committee said they did not favour the immediate outlay of any such sum as £9000, which would be necessary to give effect to the changes proposed by the Gas Company, as they were of opinion that a considerable improvement could be effected by the adoption of an improved pattern of inverted burner and reflector in the existing lamps; and the improvement made by this alteration would, they believed, be found adequate, so far as regarded the lighting of the smaller streets, at least for such period as would lapse before the existing Kensington pattern lamps were worn out. The Sub-Committee also proposed to inspect a number of the existing lamps fitted with two and three inverted burners respectively and improved reflectors, with the view of considering whether the Kensington pattern lanterns should not for the present be retained in other and more important thoroughfares; and they said that so soon as they had had adequate time to consider these suggested alterations, they would report further thereon. The Works Committee expressed concurrence in the views of the Sub-Committee, and recommended that the Gaslight and Coke Company be informed that the Council do not see their way to accept their offer. The report, after having been heavily damaged in debate, was sent back to the Committee.

**Egremont Gas Company to be Wound Up.**—At an extraordinary general meeting of the Egremont Gaslight and Coke Company recently held, a resolution was passed to the effect that the Company should be wound-up voluntarily.

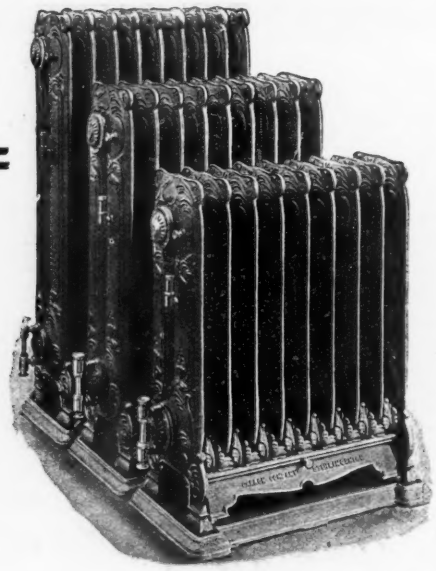
**Cudworth and its Gas Supply.**—The ratepayers, at a public meeting, have expressed approval of the action of the Cudworth Urban District Council in promoting an application to the Local Government Board for a Provisional Order authorizing the Council to construct gas-works in the township. At present the gas is supplied in bulk to the Council by the Barnsley Gas Company. Mr. G. H. England presided, and said the Council had decided to purchase land costing £850; and Mr. Newbigging, their Engineer, had stated that it was possible to supply gas to consumers at 3s. 6d. per 1000 cubic feet, and make a profit. It was suggested that gas-works should be erected to produce 15 million cubic feet a year. Mr. G. H. Gray moved that the Council enter into a contract with the Barnsley Gas Company, for a period of fourteen years, to supply gas at 2s. per 1000 cubic feet. This was seconded; but only ten hands were held up in its favour.


CARRON GAS-HEATED

STEAM RADIATORS.

For heating both small and extensive areas "Carron" Gas Radiators have proved invaluable, being the most economical and cheapest make of heating apparatus.

¶ Carron Company hold large Stocks of finished Radiators and Castings, and are in a position to execute orders for any size of Radiator on receipt.



*Gas Radiator Pamphlet . . . free on . . . . application. .*

CARRON COMPANY

CARRON, STIRLINGSHIRE.

**Gas Supply in Monte Video.**—The British Consul in Uruguay states in his annual report that the Monte Video Gas Company are now established in a handsome new building in one of the principal streets. It is lofty and spacious, with ample window fronting, which affords full opportunity for a brilliant and attractive display of goods. In spite of the keen competition of electric lighting, the Company are steadily increasing their business, and at the present time have about 125 miles of mains in use. The price of gas, which in 1867 was 4s. 1d. per 1000 cubic feet, has been gradually reduced to the present moderate figure of 1s. 9½d. for lighting and 1s. 4½d. for other purposes.

**Improved Lighting for Bideford.**—A scheme by which the lighting of the town is to be greatly improved was submitted by the Bideford Gas Company to the Town Council at their last meeting. The subject has been under negotiation through a Sub-Committee, and the Council reappointed these gentlemen with instructions to consider and report further upon it. In view of the larger outlay required, the Company stated that if the scheme were accepted they would require the lighting contract to be entered into for five years, instead of three years as hitherto. Mr. Cocks said the members of the Committee were very much impressed by the fact that if the scheme were carried out the town would be very much better lighted than it had been in the past. The annual charge would be £580—an increase of £70 or £80 upon the present basis; but this would not be more than the town had had to pay the past few years. Mr. Adams remarked that the Gas Company had met the Corporation very fairly. Mr. Goaman said it was proposed to light the main streets in a very brilliant manner. Indeed, Bideford promised to be the best lit town in North Devon.

**Improved Public Lighting at Lewisham.**—The Highways Committee of the Lewisham Borough Council have had under consideration applications from the South Metropolitan Electric Light and Power Company and from the South Metropolitan Gas Company, for permission to erect high-power lamps and standards on the footway on a portion of the west side of High Street, Lewisham; also from the Electric Light Company, to erect similar standards in Burnt Ash Road, and from the Gas Company to erect 24 standards in Brockley Road. The first-named Company forwarded with their application a memorandum signed by sixteen tradesmen in High Street, agreeing to pay the Company for the lighting and maintenance of the lamps if erected, and also from one asking that the Company might be allowed to erect an electric light standard in front of his premises. The Gas Company sent a similar memorandum signed by eighteen tradesmen in support of their application. The names, with few exceptions, were the same in both cases. Similar applications from these Companies had been conditionally granted on former occasions; the Gas Company giving a public lamp free for the concession, and the Electric Light Company keeping an incandescent light of 50-candle power burning after the high-pressure lamps were extinguished. The Committee decided that the application of the Gas Company in respect of parts of High Street, Lewisham, and Brockley Road, and that of the Electric Light Company in regard to Burnt Ash Road, should be granted conditionally.

**Vancouver Water Supply.**—According to the "Monetary Times" of Toronto, the Municipality of Vancouver propose to expend a sum of about £142,000 in laying another water-main from the Capilano River to the Little Mountain reservoir.

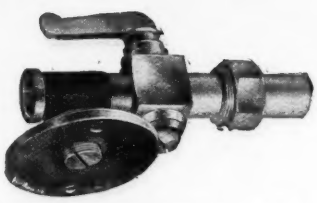
**New Joint-Stock Companies Registered.**—The Gas Maintenance Company, Limited, has been registered with a capital of £5000 in £1 shares, to carry on, in Nottingham and elsewhere, the business of a gas and electric light maintenance company, and to adopt an agreement with A. Docking. The subscribers (all of Nottingham) are: A. Docking, gas engineer; T. Callan, colliery agent; F. Stokes, incorporated accountant; F. H. Guy, engineer; and F. W. Barnes, lace manufacturer. The Combination Gas-Steam Engine Syndicate, Limited, with a capital of £500, in 1s. shares, has been formed to acquire certain patents for an invention for a combined internal combustion and fluid-pressure engine, and to adopt an agreement with H. B. Stocks. The Furness Chemical Company, Limited, has been registered with a capital of £2000, in £1 shares.

**Bideford Water Supply.**—The question of improving the water supply has been under the consideration of a Committee of the Bideford Town Council. A report on the subject was prepared by Mr. Portsmouth; but the Committee did not agree with him that a new reservoir was needed. They found, as the result of tests, that there was sufficient pressure to supply the higher portion of the town when the water was taken from the lower reservoir and not from the filter-beds; and they therefore recommended the use of patent filters as advised by Mr. Portsmouth. They suggested that the question of increasing the capacity of the reservoirs should be referred to Mr. Baldwin Latham. Alderman Metherall explained that the matter of renewing the mains had also been considered; and the opinion was that some portion of the mains which had been reported upon need not be relaid if the patent filters were adopted, because the extra pressure would give an abundant supply for the top of the town.

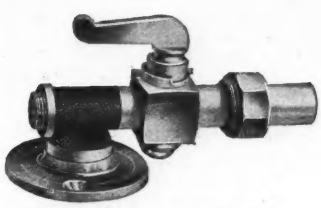
**Sales of Shares.**—At the Mart, Tokenhouse Yard, last Tuesday, Messrs. A. & W. Richards offered for sale, by order of Directors, new issues of capital in the Southend Water Company and the Barnet District Gas and Water Company. The first lots consisted of £5000 of 4 per cent. perpetual debenture stock of the Southend Company; and they were all sold at £100 to £100 10s. per £100. The new issue by the Barnet Company consisted of £10,000 of "D" capital water stock, ranking for a maximum dividend of 7 per cent., but carrying 5¼ per cent. as from the 1st prox. It fetched £110 to £112 per £100. The same day, Messrs. W. Watson and Son sold a few fully-paid £5 shares in the Ripley Gas Company at an average price of £10 16s. 6d. each. According to an announcement which appeared in the "JOURNAL" a few weeks ago, Messrs. Nichols, Young, Hunt, and Co. offered for sale last Thursday £15,000 of 5 per cent. maximum capital stock and £10,000 of 4 per cent. debenture stock of the Bristol Gas Company. The average price realized for the ordinary stock was £113 18s. per £100, and for the debenture stock £100 6s. 1d. per £100; the total of the former being £17,085 5s.; and of the latter £10,030 10s.


*Something New!*

**TWO-WAY GAS FIRE TAP.**



USED AS STRAIGHT-WAY TAP.



USED AS ELBOW TAP.

**The alteration is made by changing the position of Screwed Plug.**

**SOLE MAKERS**

**SAWER AND PURVES,**

NELSON METER WORKS, **MANCHESTER.** RADFORD METER WORKS, **NOTTINGHAM.**

WIRES { "SAWER MANCHESTER." / "SAWER NOTTINGHAM." } TELEPHONE NOS. { 3289 (City) MANCHESTER. / 2025 (Central) NOTTINGHAM.

*Agent for Scotland:* JNO. D. GIBSON, 2, Causeyside Street, PAISLEY.

The Admiralty have placed an extensive order for coal tipping and loading plant with Messrs. Ed. Bennis and Co., Limited, of Little Hulton, Bolton.

Referring to the recent successful gas exhibition at Theale, a notice of which appeared in the "JOURNAL" last week (p. 729), we learn that it was organized by the Davis Gas-Stove Company, Limited, in association with the Theale Gas Company.

In the report presented at the meeting of the Hastings and St. Leonards Ratepayers' Association last Thursday, reference was made to the amount spent in the opposition by the Corporation to the Gas Companies (Standard Burner) Bills; and it was remarked that the ratepayers would have noted with surprise that it was not given up before. In the course of the proceedings, attention was called to the proposal to have electric light instead of incandescent gas at the Workhouse; and it was decided to ask the Local Government Board (to whom the matter has been referred) to suspend their decision until they have further information.

The Westminster City Council, in order to carry out photometric tests of street lighting in connection with the new contract with the Gaslight and Coke Company, are further equipping the existing dark-room at the Taylor's Buildings depôt, and providing apparatus for standardizing the photometer. The Highways Committee have considered the lighting of the yard at the Monk Street depôt, and have decided on having a high-pressure gas-lamp. They have accepted the quotation of the Gaslight and Coke Company for installing and maintaining a 300-candle power gas-lamp, at an initial cost of £4 and an annual cost of £6 10s. for gas and maintenance.

At last Wednesday's meeting of the Manchester City Council, Mr. Jennison called attention to the action of the Gas Committee in agreeing to let the gas supplied to the exhibitors at the Rusholme and City Hall exhibitions be invoiced at 1s. 6d. per 1000 cubic feet; and that all gas-fires, gas-stoves, and other apparatus sold for cash at list prices during the existence of the exhibitions be fixed free of cost to the purchasers, provided that they are consumers in the Committee's district of supply. He thought if gas could be supplied to these people at the prices named, it was unfair to charge the penny-in-the-slot users 2s. 9d. per 1000 cubic feet. The action was defended as fair and reasonable in that it was likely to encourage trade and the use of gas for cooking and heating purposes, and thereby tend to the purification of Manchester air. The Council approved the Committee's proposal.

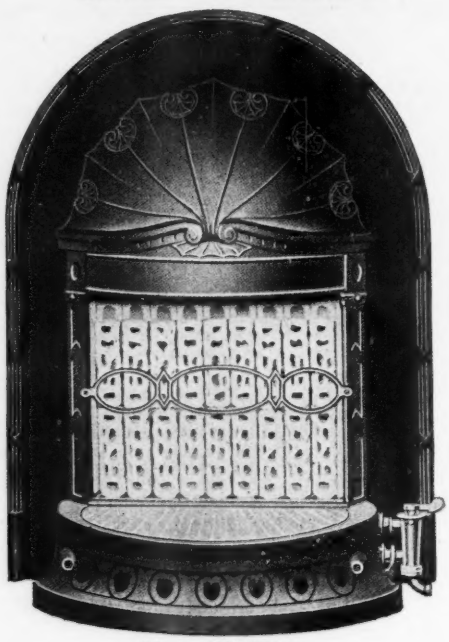
In the report which the Directors of Messrs. James Milne and Son, Limited, will submit at the annual general meeting on Thursday, they state that the volume of business increased in the year ended the 30th of September last; and that, notwithstanding the keen competition and cutting in prices, there is a marked improvement in the trading as compared with the previous twelve months. There is a surplus balance of £591, against which, however, depreciation on plant, machinery, and buildings to the extent of £1147 has to be charged; thus leaving a debit of £556. Adding to this the sum brought forward from last year, including the Directors' fees for 1908-9, £5073, the total amount at the debit of the profit and loss account is £5629. On the 22nd of November a most unfortunate fire occurred, completely gutting the gas-meter shop. The producing machinery and store of meter parts were, however, untouched—being in a separate building. The loss is fully covered by insurance.

## APPLICATIONS FOR LETTERS PATENT.

27,679.—BARRETT, S. R., "Fuel and backs for gas-stoves." Nov. 28.
27,697.—EVERETT, S., "Obtaining various products from coal, shale, peat, and the like." Nov. 28.
27,706.—MEYER, F. C., "Gas-cooking apparatus." Nov. 28.
27,742.—COVENTRY, W., and SCHUTE, H. G., "Injectors for incandescent burners." Nov. 29.
27,747.—COOK, H. T., "Stopper for pipe leaks." Nov. 29.
27,758.—BELL, W., "Gas-stoves." Nov. 29.
27,810.—SHONE, G., "Prepayment meters." Nov. 30.
27,843.—LAMKIN, A. E., and GODWIN, L. G., "Manufacture and use of oil gas." Nov. 30.
27,848.—LIEBLICH, E., "Generating compressed gas." Nov. 30.
27,873.—WEIL, J. A., and HUTCHINS, T. W. S., "Gas-producers." Nov. 30.
27,928.—TOWNSEND, W. W., "Gas-heating stove with down-take flue." Dec. 1.
27,921.—WATSON, C., and FORD, J., "Gas-fittings." Dec. 1.
27,934.—GOLBY, F. W., "Gas-engines." A communication from H. H. Taylor, C. L. Spade, and W. A. Murray. Dec. 1.
27,940.—HART, C., "Burner for water-heater." Dec. 1.
27,986.—CANNING, T. F., "Electric gas lighting and extinguishing apparatus." Dec. 1.
27,998.—LETHBRIDGE, C. E. H., "Generating and utilizing gaseous fluids." Dec. 2.
28,004.—GREEN, W., and HUNCOAT PLASTIC BRICK AND TERRA COTTA COMPANY, "Gay Lussac and Glover or other towers." Dec. 2.
28,007.—BEARD, G. F. H., and R. & J. DEMPSTER, LTD, "Washing or scrubbing gas." Dec. 2.
28,031.—VOORHEES, G. T., "Compressing air or gas." Dec. 2.
28,032.—SCHAFFER, V., "Fuel." Dec. 2.
28,033.—TANNETT-WALKER, F. W., "Hoisting and discharging coal." Dec. 2.
28,111.—HELPS, G., "Gas-lamps." Dec. 3.
28,128.—HARRAP, J. E., "Connecting flanged pipes." Dec. 3.
28,153.—LUCAS, F. L., "Burners." Dec. 3.
28,154.—COFFIN, A. G., "Atmospheric burners." Dec. 3.
28,174.—GRANT, H. C. S., and GUMBRELL, G. E., "Combustible turbine gas-engine." Dec. 3.
28,176.—MORGAN, W. L., "Incandescent burners." Dec. 3.


**Summit of Superiority.**

WILSON
**GAS FIRES.**

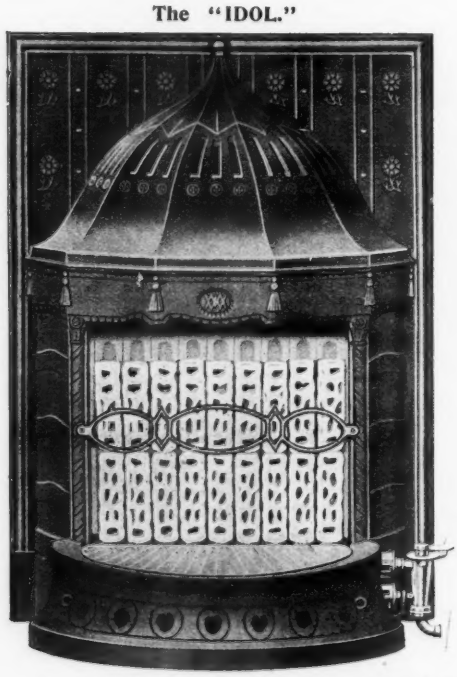


The "ELITE."

3
SIZES
of each Fire with
INTERCHANGEABLE PARTS

PATENTED REVERSIBLE DUPLEX BURNER & TAP
To Sizes Nos. 2 and 3.
COPPER REFLECTOR
to
ALL SIZES.

The "IDOL."



*Prices and Descriptive Leaflets on application.*

**WILSONS & MATHIESONS, LTD.,**
**Carlton Works,**
**ARMLEY, LEEDS.**

London Show-Rooms: 76, QUEEN STREET, CHEAPSIDE, E.C.

The "battle of the lights" is being vigorously fought at Reading. The Reading Electric Supply Company recently came out with a bold advertisement in a local paper in which they quoted Dr. George Carpenter to the effect that "gas in burning gives off quantities of carbonic acid and sulphuretted hydrogen, which vitiate the air." The Gas Company replied in an equally bold manner, correcting the misstatement as to sulphuretted hydrogen; and pointing out that the Medical Officer of Health has always certified the Reading gas to be free from this impurity under the test imposed by Act of Parliament. Another assertion by the Electric Supply Company was that theirs is the only artificial light which keeps the air of a room as pure as in daylight. The Gas Company replied by calling attention to the fact that the Society of Medical Officers of Health have substituted gas for electric lighting in the large room in which they hold their meetings, in order to obtain a better light, and to assist in the ventilation of the room. The Society have placed it on record in their "Journal" that the new pattern ventilating gas-lamp in the centre of the ceiling has been found an excellent substitute for the electric lamps previously employed. This confirms the statements made by Dr. Rideal, Professor Vivian B. Lewes, Dr. W. A. Aikin, and others, that the change of air which is necessary in rooms is retarded by the absence of gas-burners.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

**Situation Vacant.**

FITTER. No. 5330.

**Plant, &c. (Second-Hand), for Sale.**

PUMPING ENGINE, PUMPS, &c. Tonbridge Water Works Company.

**Shares Wanted.**

CEARA GAS COMPANY. No. 5329.

**TENDERS FOR**

**Fire-Clay Goods.**

LEICESTER CORPORATION. Tenders by Dec. 31.

**Oxide (Spent).**

KINGS LYNN GAS COMPANY.

**Pipes, &c.**

LEICESTER CORPORATION. Tenders by Dec. 31.

**Tar.**

DARENTH ASYLUM (Dartford). Tenders to Metropolitan Asylums Board by Jan. 2.

## TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Dec. 10. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

| Article. | Basis. | London. | North-East Coast. | East Coast, Yorks. | West Coast. | | Glasgow. |
|---|---|---|---|---|---|---|---|
| | | | | | Liverpool. | Manchester. | |
| Tar crude | per ton | 21/– | 18/6 21/– | 19/– 21/3 | 19/– 21/– | 19/– 21/– | — |
| Pitch | ,, | 34/– 35/– | 32/– 32/6 | 32/6 33/– | 33/– 34/– | 33/– | 33/– |
| Benzol, 90 % | per gallon | –/9 | –/7½ –/8 | –/8 | –/7¼ –/7½ | –/7⅞ –/8¼ | –/8 |
| Benzol, 50-90% | ,, | –/10 | –/8¼ –/8½ | –/9 | –/8 –/8¼ | –/8 –/8¼ | — |
| Toluol, 90% | ,, | –/10 | –/9 –/9¼ | –/10 | –/10 | –/9½ –/10 | –/10 |
| Crude naphtha, 30% | ,, | — | –/3¼ –/3½ | –/3½ | –/3⅜ | –/3⅝ | — |
| Light oil, 50% | ,, | — | –/3¼ | –/3⅜ –/3⅝ | –/3⅜ | –/3⅝ | — |
| Solvent naphtha, 90-160 | ,, | — | –/10½ –/11 | –/10 | — | –/11½ | –/11 |
| Heavy naphtha, 90-190 | ,, | — | –/11 | –/11 | –/11 | –/11⅛ 1/– | –/11 |
| Creosote in bulk | ,, | –/2⅜ –/2⅝ | –/2 –/2¼ | –/2 | –/2 –/2⅛ | –/2 –/2⅛ | –/2 |
| Heavy oils | ,, | –/3 –/3¼ | –/2⅛ –/2⅜ | –/2¼ | –/2⅝ | –/2⅞ | –/2⅞ |
| Carbolic Acid, 60's | ,, | 1/0½ 1/1 | 1/– 1/1 | 1/1 | 1/0⅜ | 1/0⅛ 1/1 | 1/1 |
| Naphthalene, crude drained salts | per ton | — | 42/6 45/– | 40/– 42/6 | 47/6 | 47/6 50/– | — |
| ,, pressed | ,, | — | 60/– | 63/– | 60/– | 60/– 72/6 | — |
| ,, whizzed | ,, | 80/– | — | — | 70/– 72/6 | 60/– 72/6 | 65/– |
| Anthracene | per unit | –/2 | –/1⅜ | –/1½ | –/1¼ | –/1¼ | — |

## GAS COMPANIES' STOCK AND SHARE LIST.

**Referred to on p. 769.**

| Issue. | Share. | When Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 1,551,868 | Stk. | Oct 14 | 5 | Alliance & Dublin Ord. | 83–86 | .. | 5 16 3 |
| 374,000 | Stk. | July 14 | 4 | Do. 4 p.c. Deb. | 93–98 | .. | 4 1 8 |
| 200,000 | 5 | Oct. 28 | 7 | Bombay, Ltd. | 6⅜–6¾ | +⅛ | 5 1 10 |
| 40,000 | 5 | ,, | 7 | Do. New, £4 paid | 5–5½ | .. | 5 6 8 |
| 50,000 | 10 | Aug. 31 | 15 | Bournemouth Gas and Water: 10 p.c. | 28¼–29½ | .. | 5 1 8 |
| 311,810 | 10 | ,, | 7 | Do. B 7 p.c. | 16½–16⅝ | .. | 4 3 7 |
| 75,000 | 10 | ,, | 6 | Do. Pref. 6 p.c. | 14⅜–15¼ | .. | 3 18 8 |
| 330,000 | Stk. | Aug. 12 | 12½ | Brentford Consolidated | 248–251 | .. | 4 19 7 |
| 330,000 | ,, | ,, | 9⅜ | Do. New | 186–188 | .. | 5 1 1 |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 120–122 | .. | 4 2 0 |
| 206,250 | ,, | June 10 | 4 | Do. 4 p.c. Deb. | 99–101 | .. | 3 19 3 |
| 220,000 | Stk. | Aug. 31 | 11 | Brighton & Hove Orig. | 215–218 | .. | 5 0 11 |
| 246,320 | ,, | ,, | 8 | Do. A Ord. Stk. | 158–161 | .. | 4 19 5 |
| 460,000 | 27 | Sept. 29 | 16⅝ | British | 44–45 | .. | 4 12 4 |
| 109,000 | Stk. | Aug. 11 | 6 | Bromley, A 5 p.c. | 117–119 | .. | 5 0 10 |
| 165,700 | ,, | ,, | 4½ | Do. B 3⅛ p.c. | 88–90 | .. | 5 0 0 |
| 82,278 | ,, | ,, | 5⅛ | Do. C 5 p.c. | 107–109 | .. | 5 0 11 |
| 55,000 | ,, | June 29 | 3⅛ | Do. 3½ p.c. Deb. | 85–87 | .. | 4 0 6 |
| 250,000 | Stk. | ,, | 4 | Buenos Ayres 4 p.c. Deb. | 97–99 | .. | 4 0 10 |
| 100,000 | 10 | — | — | Cape Town & Dis., Ltd. | 3–4 | .. | — |
| 100,000 | 10 | — | — | Do. 4½ p.c. Pref. | 4⅜–5⅛ | .. | — |
| 50,000 | 50 | Nov. 2 | 6 | Do. 6 p.c. 1st Mort. | — | .. | — |
| 100,000 | Stk. | June 29 | 4½ | Do. 4½ p.c. Deb. Stk. | 92–92 | .. | 4 17 10 |
| 157,150 | Stk. | Aug. 12 | 5 | Chester 5 p.c. Ord. | 109⅛–111⅛ | .. | 4 9 8 |
| 1,513,280 | Stk. | ,, | 5⅛ | Commercial 4 p.c. Stk. | 106–109 | .. | 4 15 5 |
| 560,000 | ,, | ,, | 5 | Do. 3½ p.c. do. | 101–103 | .. | 4 17 1 |
| 475,000 | ,, | June 29 | 3 | Do. 3 p.c. Deb. Stk. | 79–81 | .. | 3 14 1 |
| 800 000 | Stk. | June 10 | 4† | Continental Union, Ltd. | 88–93 | .. | 4 6 0 |
| 200,000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 137–139 | .. | 5 0 9 |
| 492,270 | Stk. | — | 5½ | Derby Con. Stk. | 122–124 | .. | 4 8 9 |
| 55,000 | ,, | — | 4 | Do. Deb. Stk. | 104–105 | .. | 3 16 2 |
| 148,995 | ,, | Oct. 14 | 5 | East Hull 5 p.c. Ord. | 103–105 | .. | 4 15 3 |
| 486,090 | 10 | July 14 | 12 | European, Ltd. | 23¾–24½ | .. | 4 19 0 |
| 354,060 | 10 | ,, | 12 | Do. £7 10s. paid. | 17⅞–18⅛ | .. | 4 18 8 |
| 16,179,445 | Stk. | Aug. 12 | 4⅜ | Gas light and Coke: 4 p.c. Ord. | 105⅝–106⅝ | .. | 4 7 5 |
| 2,600,000 | ,, | ,, | 3½ | 3½ p.c. max. | 87–89 | .. | 3 18 8 |
| 4,002,235 | ,, | ,, | 4 | 4 p.c. Con. Pref. | 103–105 | .. | 3 16 2 |
| 4,531,705 | ,, | June 29 | 3 | 3 p.c. Con. Deb. | 80–82 | .. | 3 13 2 |
| 258,740 | Stk. | Sept. 15 | 5 | Hastings & St. L. 3½ p.c. | 92–94 | .. | 5 6 5 |
| 82,500 | ,, | ,, | 6⅜ | Do. do. 5 p.c. | 114–116 | .. | 5 12 1 |
| 70,000 | 10 | Oct. 14 | 11 | Hongkong & China, Ltd. | 17–17⅛ | .. | 6 5 8 |
| 131,070 | Stk. | Sept. 15 | 7⅜ | Ilford A and C | 145–148 | .. | 4 19 8 |
| 65,780 | ,, | ,, | 5⅜ | Do. B | 114–116 | +2 | 5 1 3 |
| 65,500 | ,, | June 29 | 4 | Do. 4 p.c. Deb. | 98–100 | .. | 4 0 0 |

| Issue. | Share. | When Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 4,940,000 | Stk. | Nov. 11 | 9 | Imperial Continental | 185–187 | .. | 4 16 3 |
| 1,235,000 | Stk. | Aug. 12 | 3⅛ | Do. 3½ p.c. Deb. Red. | 64–96 | .. | 3 12 11 |
| 200,242 | Stk. | Aug. 31 | 6 | Lea Bridge Ord. 5 p.c. | 120—.22 | .. | 4 18 4 |
| 561,000 | Stk. | ,, | 10 | Liverpool United A. | 220–222 | .. | 4 10 1 |
| 718,100 | ,, | ,, | 7 | Do. B | 164–165 | +½ | 4 4 10 |
| 306,083 | ,, | June 29 | 4 | Do. Deb. Stk. | 104–106 | .. | 3 15 6 |
| 75,000 | 5 | June 29 | 6 | Malta & Mediterranean | 4¾–5 | .. | 6 0 0 |
| 560,000 | 100 | Oct. 1 | 5 | Met. of 5 p.c. Deb. | 99–101 | .. | 4 19 0 |
| 250,000 | 100 | ,, | 4½ | Melbourne 4½ p.c. Deb. | 99–101 | .. | 5 9 10 |
| 541,920 | 20 | Nov. 11 | 3⅜ | Monte Video, Ltd. | 12¼–12⅝ | .. | 5 9 10 |
| 1,775,892 | Stk. | July 28 | 4⅜ | Newc'tle & G'tesh'd Con. | 102–103 | .. | 4 5 0 |
| 529,435 | Stk. | June 29 | 3⅜ | Do. 3½ p.c. Deb. | 90–91 | .. | 3 16 11 |
| 55,940 | 10 | Aug. 31 | 7 | North Middlesex 7 p.c. | 13⅜–14½ | .. | 4 16 7 |
| 300,000 | Stk. | Nov. 30 | 8 | Oriental, Ltd. | 136–138* | .. | 5 15 11 |
| 60,000 | 5 | Sept. 15 | 8 | Ottoman, Ltd. | 6¼–6⅝ | .. | 5 18 6 |
| 31,800 | 53 | Aug. 31 | 13 | Portsea Island A. | 131–133 | .. | 5 3 0 |
| 60,000 | 50 | ,, | 13 | Do. B. | 124–126 | .. | 5 3 2 |
| 100,000 | 50 | ,, | 12 | Do. C. | 117–119 | .. | 5 0 10 |
| 114,800 | 50 | ,, | 10 | Do. D and E. | 102–104 | .. | 4 16 2 |
| 398,490 | 5 | Oct. 28 | 7 | Primitiva Ord. | 7⅛–7⅜ | .. | 4 13 4 |
| 796,980 | 5 | June 29 | 5 | Do. 5 p.c. Pref. | 5⅛–5⅜ | .. | 4 13 0 |
| 488,900 | 100 | Dec. 1 | 4 | Do. 4 p.c. Deb. | 95–97* | .. | 4 2 6 |
| 312,650 | Stk. | June 29 | 4 | River Plate 4 p.c. Deb. | 97–99 | .. | 4 0 10 |
| 250,000 | 10 | Sept. 29 | 9 | San Paulo, Ltd. | 15⅜–15⅝ | .. | 5 14 3 |
| 115,030 | 10 | ,, | 6 | Do. 6 p.c. Pref. | 11¼–11½ | .. | 5 2 2 |
| 125,000 | 50 | July 1 | 5 | Do. 5 p.c. Deb. | 51–52 | .. | 4 16 2 |
| 135,000 | Stk. | Aug. 31 | 10 | Sheffield A | 229–231 | .. | 4 6 7 |
| 209,984 | ,, | ,, | 10 | Do. B | 229–231 | .. | 4 6 7 |
| 523,500 | ,, | ,, | 10 | Do. C | 229–231 | .. | 4 6 7 |
| 70,000 | 10 | Oct. 14 | 6 | South African | 10⅞–11⅛ | .. | 5 6 8 |
| 6,429,895 | Stk. | Aug. 12 | 5/9/4 | South Met., 4 p.c. Ord. | 121–123 | .. | 4 8 10 |
| 1,895,445 | ,, | July 14 | 3 | Do. 3 p.c. Deb. | 80–82 | .. | 3 13 2 |
| 209,820 | Stk. | Aug. 31 | 8 | South Shields Con. Stk. | 155–157 | .. | 5 1 11 |
| 605,000 | Stk. | Aug. 12 | 5⅜ | S'th Suburb'n Ord. 5 p.c. | 120–122 | .. | 4 12 9 |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 120–122 | .. | 4 2 0 |
| 117,058 | ,, | July 14 | 5 | Do. 5 p.c. Deb. Stk. | 123–124 | .. | 4 0 8 |
| 502,310 | Stk. | Nov. 11 | 5 | Southampton Ord. | 109–111 | .. | 4 10 1 |
| 120,000 | Stk. | Aug. 12 | 7 | Tottenham and Edmonton: A 5 p.c. | 141–143 | .. | 4 17 11 |
| 483,940 | ,, | ,, | 5⅜ | B 3⅜ p.c. | 112–114 | .. | 4 16 6 |
| 149,470 | ,, | June 29 | 4 | 4 p.c. Deb. | 97–99 | .. | 4 0 0 |
| 182,380 | 10 | June 10 | 8 | Tuscan, Ltd. | 9–9⅜ | .. | 8 8 6 |
| 149,900 | 10 | July 1 | 5 | Do. 5 p.c. Deb. Red. | 98–100 | .. | 5 0 0 |
| 236,476 | Stk. | Aug. 31 | 5 | Tynemouth, 5 p.c. max. | 113–115 | .. | 4 6 11 |
| 255,636 | Stk. | Aug. 31 | 6⅝ | Wandsworth: B 3⅜ p.c. | 140–142 | .. | 4 15 1 |
| 85,766 | ,, | June 29 | 3 | 3 p.c. Deb. Stk. | 74–76 | .. | 3 18 11 |

Prices marked * are "Ex div." † Next dividend will be at this rate.

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RETORTS AND FIRE-BRICKS.

**THE Gas Committee of the above Cor-** poration are prepared to receive TENDERS for the Supply and Delivery of RETORTS and FIRE-BRICKS required for the Year 1911.
Specification, Quantities, and Form of Tender can be obtained upon Application to the Engineer.
Tenders, addressed to Mr. Alderman T. Smith, J.P., Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 31, 1910.
The Committee do not bind themselves to accept the lowest or any Tender.
Hubert Pooley, Assoc.M.Inst.C.E.,
Engineer and Manager.
Gas Offices: Millstone Lane,
Leicester, Dec. 12, 1910.

CORPORATION OF LEICESTER.
(Gas Department.)
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Tenders, addressed to Mr. Alderman T. Smith, J.P., Chairman, and endorsed "Tender for Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 31, 1910.
The Committee do not bind themselves to accept the lowest or any Tender.
Hubert Pooley, Assoc.M.Inst.C.E.,
Engineer and Manager.
Gas Offices: Millstone Lane,
Leicester, Dec. 12, 1910.

CITY OF CHICHESTER GAS COMPANY.

**NOTICE is Hereby Given, that the** TRANSFER BOOKS of the FOUR PER CENT. PERPETUAL DEBENTURE STOCK of this Company WILL BE CLOSED from the 18th of December to the 31st of December, 1910, both inclusive.
By order,
Victor V. Vick,
Offices: Stockbridge Road, Secretary.
Chichester, Dec. 9, 1910.

BARNET DISTRICT GAS AND WATER COMPANY.

**NOTICE is Hereby Given, that the** TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 24th of December, 1910, and RE-OPENED on the 1st of January, 1911.
By order of the Board,
Ernest W. Drew,
Secretary.
6 & 7, Queen Street,
London, E.C., Dec. 9, 1910.

HORNSEY GAS COMPANY.

**NOTICE is Hereby Given, that the** TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 18th inst., and RE-OPENED on the 2nd of January, 1911.
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William E. Roberts,
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63, Chancery Lane, W.C.,
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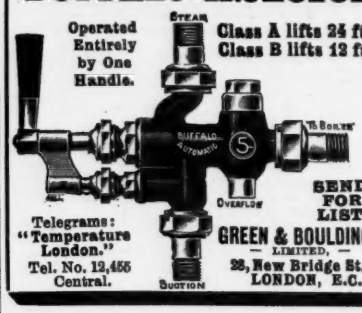


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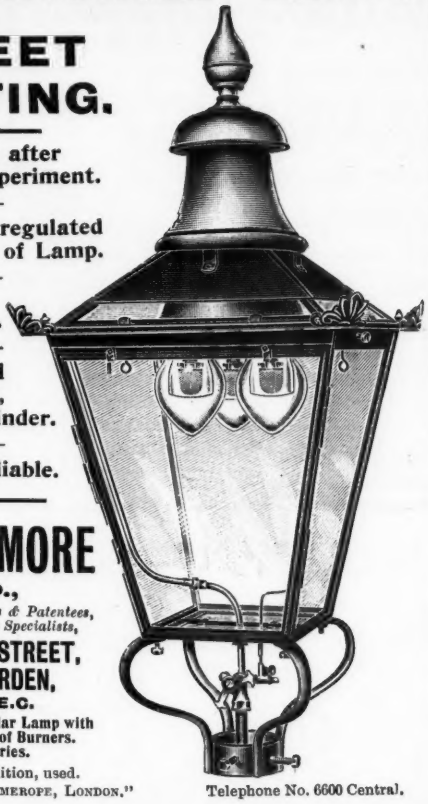

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BEST'S TRADE MARK. SURPRISE.

**SPECIAL NOTICE.**

See that every Pendant bears our Trade Mark (as above) stamped upon the balance weights!!!

MAKERS OF THE PATENT
**"SURPRISE" GAS PENDANT.**

# GAS ENGINES

Small Power Units.
High Efficiency.
Low Price. Best Design.

*Suitable for:—*

DYNAMOS,
ACCUMULATOR CHARGING, PUMPS,
FANS,
SEWING MACHINES,
AGRICULTURAL MACHINES.
COFFEE GRINDING,
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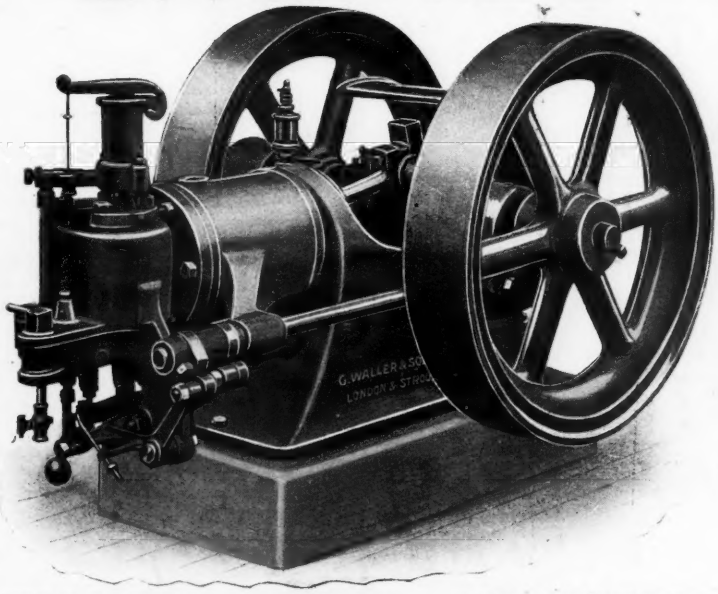
GAS PRESSURE PLANTS.

Very Attractive for Show-Room Windows.



**"PINKNEY" GAS ENGINES,**

$\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, 1\frac{1}{4}, 2, 2\frac{1}{2}$, and 3 B H.P.

On combination Baseplate or with Water Vessel separate.

Prices and Full Particulars on Application.

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HORSTMANN AUTO-ADJUSTMENT GAS CONTROLLER.

TYPE 1. WITH AUTOMATIC ADJUSTMENT, as largely used in GLASGOW, NEWCASTLE-ON-TYNE, BATH, &c., &c.

# HORSTMANN GAS CONTROLLERS

TYPE 3. New Model, WITH HAND ADJUSTMENT, as adopted by the LIVERPOOL CORPORATION LIGHTING AUTHORITIES.

(H. B. & E. Patents.)

## ARE ALL QUICK LIGHTERS.

Absolutely Certain in Action.
Fully Guaranteed.

THE

## HORSTMANN GEAR CO., LIMITED,

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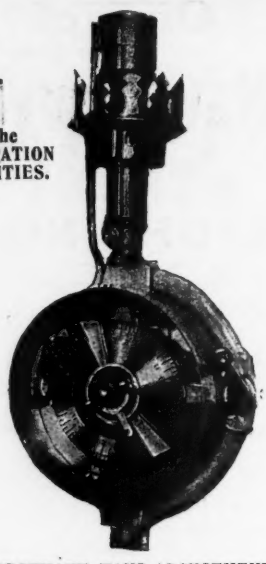

HORSTMANN HAND ADJUSTMENT GAS CONTROLLER.

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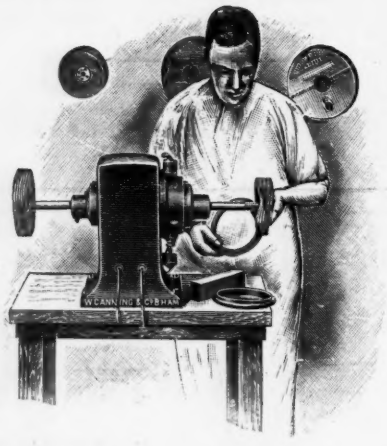


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AND

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Petrol-Air Gas gives a most brilliant Light by Mantle.

## PETROL GAS TURBINE GENERATORS PAY THEIR WHOLE COST

DURING ONE MONTH'S RUNNING IN WINTER.

The Gas is made cold, they are a splendid "Stand-By" to meet Fogs, or shortage of Gasholder capacity.

*INQUIRIES INVITED NOW, FOR NEXT SEASON.*

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## MOST IMPORTANT!

**Latest Development:**

**600 C.P. LOW PRESSURE LAMP.**

**1000 C.P. LOW PRESSURE LAMP.**

**GAS REGULATION on the TOP of the LAMP.**

**All Goods are unapproachable for economy and durability.**

**Ask Wholesalers for Catalogue and Prices.**

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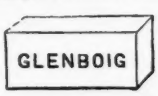
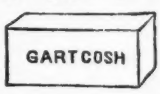
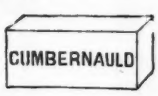
## GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

**TRADE MARKS.**




The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

**GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.**

*The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.*

**Works: GLENBOIG, LANARKSHIRE.**
**Offices: 48, West Regent St., Glasgow.**

**57 Prize Medals and Diplomas of Honour.**
**Grand Prix at Brussels International Exhibition.**
**Highest Award wherever exhibited.**

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

### ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, Leadenhall Street,
London, E.C., September 21st, 1909.

Dear Sirs,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

**CHEMICAL ANALYSIS.**

| | Raw. | Fired. |
|---|---|---|
| Silica, free | 3·03 | 3·49 |
| Silica, combined | 43·20 | 49·77 |
| Alumina | 36·55 | 42·10 |
| Ferric oxide | 1·80 | 2·08 |
| Titanic oxide | 1·30 | 1·50 |
| Lime | trace | trace |
| Magnesia | trace | trace |
| Alkaline oxides | trace | trace |
| Sulphates as trioxides | 0·92 | 1·06 |
| Loss on Ignition | 13·20 | — |
| | 100·00 | 100·00 |

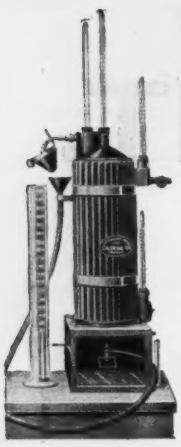
**PHYSICAL RESULTS.**

| | |
|---|---|
| Density | 2·65 |
| Volume weight | 1·90 |
| Porosity | 15·4 % |
| Linear shrinkage at 100° C. | 3·70% |
| " " " 1050° C. | 4·76% |
| " " Total | 8·46% |
| Volume shrinkage at 100° C. | 10·7 % |
| " " " 1050° C. | 12·6 % |
| " " Total | 23·3 % |
| Plasticity | 20·0 % |
| Fire Stability | 1850° C. equiv. 3362° F. (SEGER CONE 36.) (New Scale CONE 38.) |

(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes.—I am, yours faithfully,

JOHN T. NORMAN.



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PATENT

## GAS CALORIMETER.

HUNDREDS IN USE.

MODERATE IN PRICE.

As verified by the National Physical Laboratory.

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**ALEXANDER WRIGHT & CO., LTD.,**

**WESTMINSTER.**

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Are you troubled with **NAPHTHALENE** in your **MAINS?** If so, try our special

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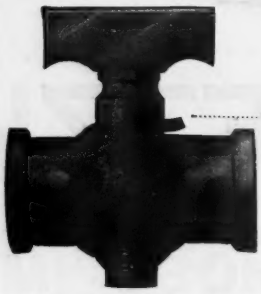


Fig. 1. The Old Style with the Old Trouble.
Note the Pin **A.**

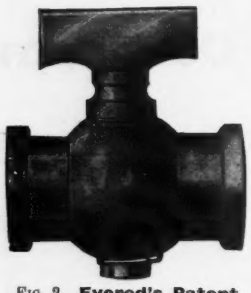

Fig. 2. **Evered's Patent "Safety Stop."** No Pin. No trouble.

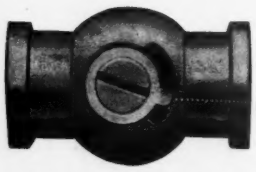


Fig. 3. Underside showing "Safety Stop" in lieu of Pin.

## EVERED'S PATENT

# "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

## EVERED'S PATENT

# "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B,** working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

**Any fitting specifically so ordered will be made with the "Safety Stop."**

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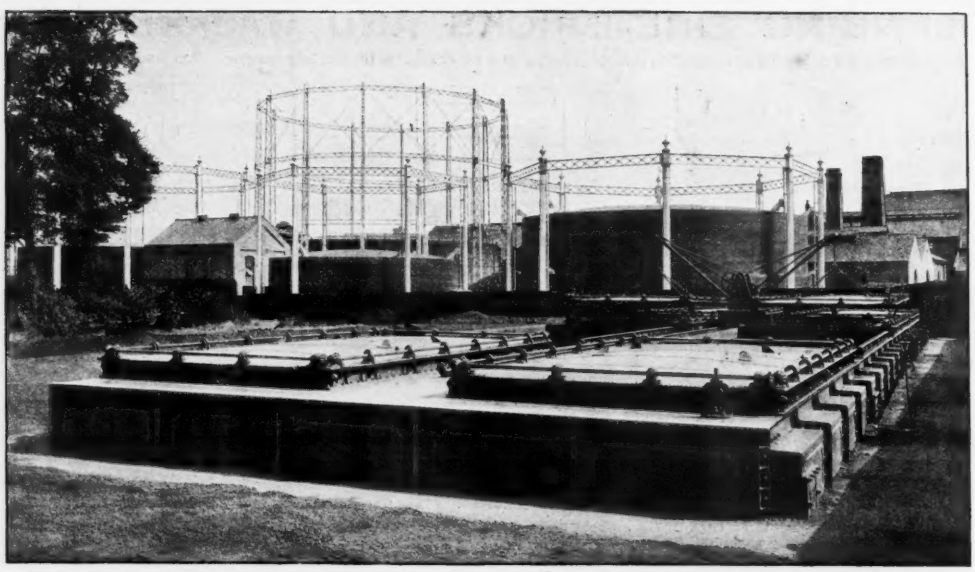

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# Welsbach
## LIGHT
## Inverted Arc Lamp, Fig. 623.

**Storm Proof—**
**For Exterior Lighting.**

**Welsbach-Kern**
**(Patent) Inverted System**

**BRITISH MADE.**

**BRITISH MADE.**

Fig. 623. Three-Light.

***Height over all.***

| | |
|---|---|
| 1-light . . . | 1 ft. 8 ins. |
| 2-light . . . | 2 ft. 4 ins. |
| 3-light . . . | 2 ft. 4 ins. |
| 4-light . . . | 2 ft. 7 ins. |

***Width over all.***

| | |
|---|---|
| 1-light . . . | 1 ft. 1 in. |
| 2-light . . . | 1 ft. 5 ins. |
| 3-light . . . | 1 ft. 5 ins. |
| 4-light . . . | 1 ft. 8 ins. |

**ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.**

| | *Gas per hour.* | *C.P.* | *Steel.* | *Copper Case.* | | *Gas per hour.* | *C.P.* | *Steel.* | *Copper Case.* |
|---|---|---|---|---|---|---|---|---|---|
| 1-light | 4 feet | 125 | **30/-** | **5/-** extra. | 3-light | 12 feet | 400 | **52/6** | **6/-** extra. |
| 2-light | 8 feet | 260 | **47/6** | **6/-** extra. | 4-light | 16 feet | 550 | **72/6** | **9/-** extra. |

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

**RENEWALS.**

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

| | *1-Light.* | *2-Light.* | *3-Light.* | *4-Light.* |
|---|---|---|---|---|
| Clear Glass Globes, each | **2/3** | **5/9** | **5/9** | **9/-** |
| " " " In Case lots per dozen. | **19/6** | **57/9** | **57/9** | **93/-** |
| *Case contains* . . | *80* | *18* | *18* | *12* |

| | *1-Light.* | *2-Light.* | *3-Light.* | *4-Light.* |
|---|---|---|---|---|
| Wired Globes, extra each | **2/-** | **2/-** | **2/9** | **3/6** |
| Parabolic Reflector, extra " | **3/6** | **6/-** | **7/6** | Not made |

Welsbach Mantles, **4½d.** each, or **4s. 3d.** per dozen subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

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LARGE AREA OF WASHING SURFACE.

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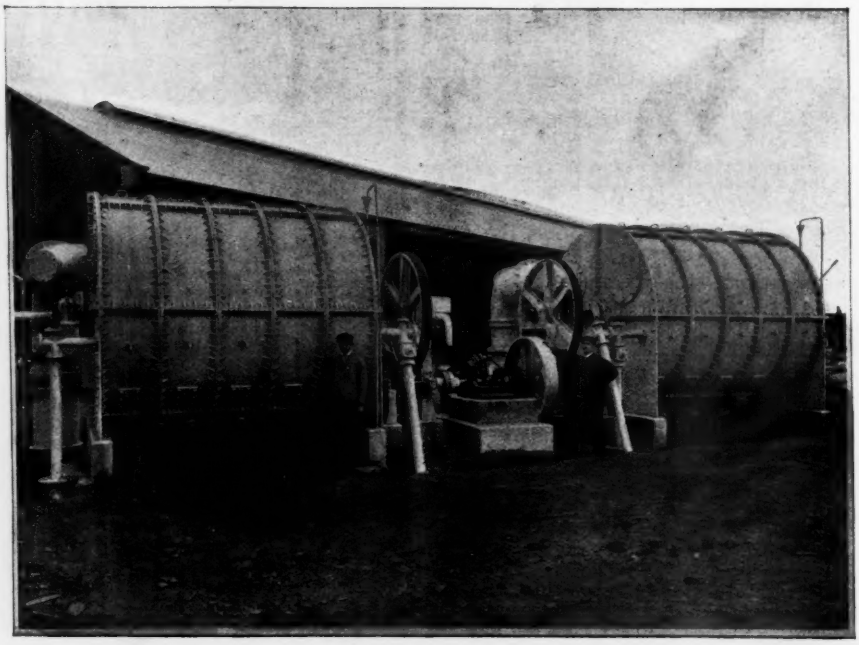

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BUNDLES EASILY ACCESSIBLE FOR CLEANING.

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Aggregate Capacity of Plants supplied
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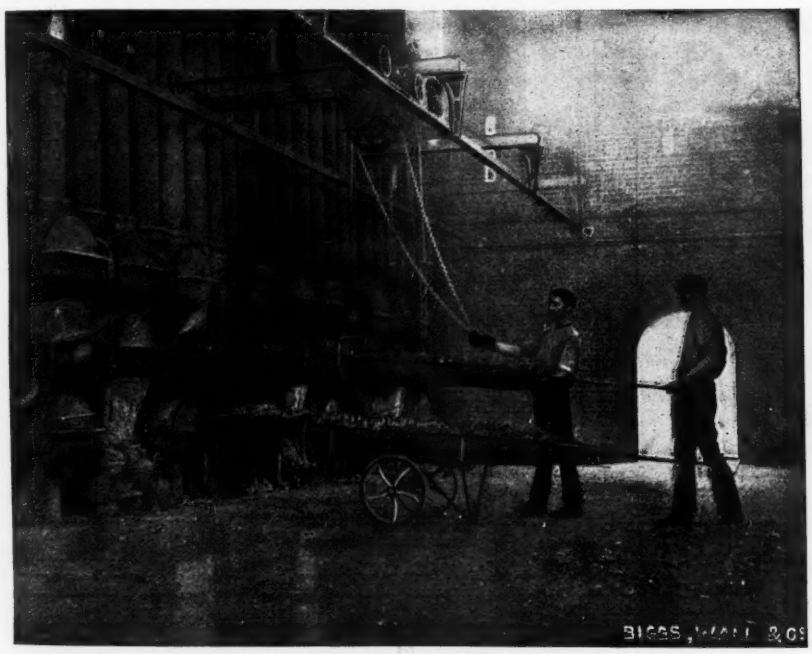

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**INCREASED YIELD OF GAS and REDUCTION OF FUEL CONSUMPTION.**

*WRITE FOR PARTICULARS*

to

**BIGGS, WALL & Co.,**

**Gas Engineers,**

**13, CROSS STREET,**
**FINSBURY, E.C.,**
**LONDON.**

Also for name of Works where you can see Machines in operation.

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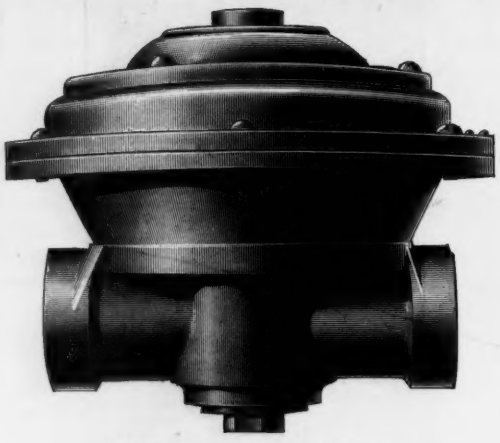

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**Large Gas Ways, Balanced Valves, also High-Pressure Governors with Mercurial Seal.**

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IN
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**WET METERS**
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WITH ORDINARY AND
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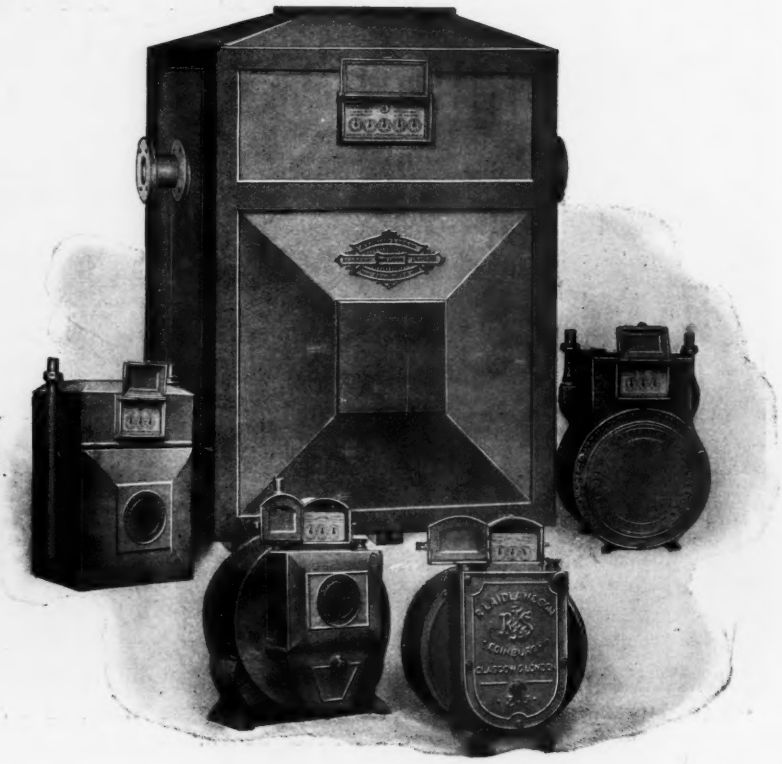
**All Materials used in the Manufacture of these Meters are of the best quality, and the Workmanship of the Highest Standard.**



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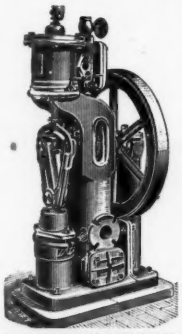
Fig. 705. "SINGLE RAM" STEAM-PUMP.

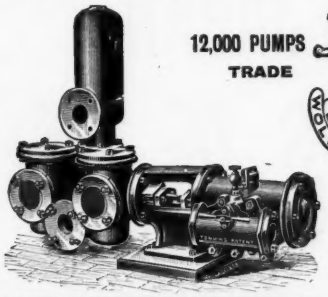
Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

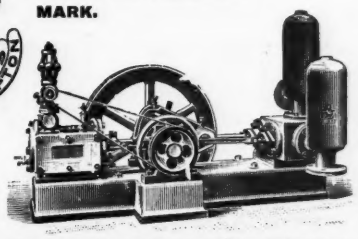
Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

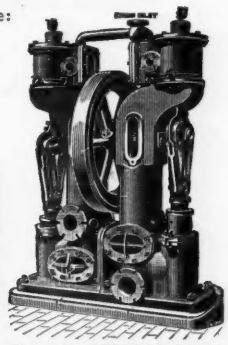
Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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